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JORDAN (E.). **Zur Gemüsesamenbeizung.** [On vegetable seed disinfection.]—*Obst- und Gemüsebau*, lxxx, 4, pp. 54–55, 1934.

Referring to some recent work on the treatment of vegetable seeds against fungous diseases (which are estimated to be responsible for a reduction of 20 per cent. in the yield) [*R.A.M.*, xii, p. 264], the writer summarizes the results obtained by J. Steinberg at the Geisenheim (Rhine) Viticultural, Fruit Growing, and Horticultural College and Research Institute. Even at a strength as low as 0·125 per cent., liquid uspulun caused more or less severe injury to tomato, cucumber, melon, leek, lettuce, and bean seeds, whereas dusting with ceresan or tillantin R (up to 2 per cent.) proved entirely innocuous. A stimulatory effect was frequently observed, and the temporary set-back to the growth of certain head lettuce varieties, notably Maikönig, following dusting at 0·5 per cent., was more than compensated by the later luxuriant development of the plants. A number of diseases affecting seedlings in the propagation frame were partially or wholly controlled by dusting with these preparations.

CARTWRIGHT (K. St. G.) & FINDLAY (W. P. K.). **Studies in the physiology of wood-destroying fungi. II. Temperature and rate of growth.**—*Ann. of Botany*, xlviii, 190, pp. 481–495, 1 pl., 8 graphs, 1934.

A brief account is given of the results [presented in the form of tables and graphs] obtained by the authors in their study of the temperature relations for growth in pure culture on 2 per cent. Kepler's malt extract agar of 25 species or strains of wood-destroying Basidiomycetes of various origin. The results indicate that the data thus obtained are of value for the rapid differentiation of species, besides affording a useful means for indicating the possibility of any given species occurring in a certain locality or country, and for providing data as to the optimum conditions under which to carry out tests of the resistance of different species of wood to decay by a given fungus, or to test the toxicity of wood preservatives. Reference is also made to the relation between the temperatures suitable for growth and the thermal death point of the organisms.

Among other things the work showed that the variety *domesticus* Falck of *Merulius lacrymans* may be readily distinguished from the 'wild' *M. sylvester* [*R.A.M.*, xiii, p. 341] by the fact that, while both are very similar in culture, above 23° C. the growth of the former rapidly drops off, ceasing entirely at 25° to 27°, while

that of the latter continues to about 36°. This intolerance of high temperature is believed to be one of the reasons why *M. lacrymans* is rarely found in the open on timber exposed to sunlight and does not appear to have been recorded in the tropics. On the other hand, *Schizophyllum commune* [ibid., xiii, p. 186] was shown to be able to grow at surprisingly high temperatures, with an optimum between 30° and 35°, and a maximum at about 42° to 44°. The fungus is stated to be of common occurrence in the tropics and to have been isolated on several occasions from tropical timbers, e.g., *Shorea leprosula* and mahogany.

MEIER (DOROTHY). **A cytological study of the early infection stage of the black rot of Cabbage.**—*Bull. Torrey Bot. Club*, lxi, 4, pp. 173–190, 4 pl., 1934.

A detailed and fully illustrated account is given of the author's cytological investigation of the early stages of infection of cabbage (Danish Ball Head and Flat Dutch) and cauliflower (Best of All) with *Bacterium campestre* [*Pseudomonas campestris*: *R.A.M.*, xii, p. 425]. The results of artificial infection experiments in the greenhouse confirmed the view held by previous workers that infection can only occur under conditions of high atmospheric humidity, and is effected by the entry of the bacteria through the hydathodes present at the teeth of the leaves. The cytological study showed that the passage of the bacteria from the hydathodes to the tips of the tracheids is only possible in the presence of a continuous path of liquid between the two, the same condition being also necessary for the further movement of the organisms in the tissues of the epithem region. The entrance of the bacteria was also shown to be dependent on a combination of biological and mechanical factors, among which the recession movement of drops of water contaminated with the organisms from the hydathodes when transpiration is resumed is considered to be important, while the motility of the bacteria, diffusion, and convection currents in the drops may also influence entrance to a slight degree. The bacteria retain their motility inside the invaded tissue, and their multiplication appears to be in the direction of the food supply. Their passage between the cells is rendered possible by the fact that they secrete enzymes which dissolve the middle lamellae. It was finally shown that the organism causes invagination of the cell walls, disappearance of nucleoli, the collapse of nuclei and chloroplastids against the cell walls, and a decrease in the amount of cytoplasm of the cells which, however, were only rarely seen to be invaded by a few bacteria in the early stages of infection.

KAUFMANN (O.). **Die Verwendung von Bor zur Bekämpfung der Herz- und Trockenfäule der Rüben.** [The use of boron in the control of heart and dry rot of Beets.]—*Deutsche Zuckerind.*, lix, 15, pp. 305–306, 1934.

The results [which are discussed and tabulated] of experiments at Wernersdorf, Germany (on the soil used by Brandenburg for his trials with boron for the control of heart and dry rot of beets) definitely substantiated the efficacy of this treatment [*R.A.M.*, xii, p. 2; xiii, p. 72]. The highest increases of yield coupled with

the least disease were obtained by the application, just before planting, of 10 to 15 kg. boric acid or 15 to 20 kg. borax, both of which reduced the percentage of rotted beets from 69·5 to 1 or below, while augmenting the output by about 23 to 37 per cent. The cost of treating 1 hect. of beets ranges from about M. 5 to 7·50. Borax should be used in preference to boric acid for treatments after planting (up to 15th July).

Brandes (E. W.) & Coons (G. H.). **Beet crop problems: science helps find the answers.**—*Facts about Sugar*, xxix, 3, pp. 83–85; 4, pp. 117–121, 1934.

After discussing the effect of sugar beet diseases upon yield in various parts of the United States since 1922, the authors describe the work done by the Division of Sugar Plant Investigation on sugar beet root rot and damping-off, associated with *Rhizoctonia* [*Corticium*] *solani*, *Phoma betae*, *Pythium* [*de Baryanum*], and *Aphanomyces* [*R.A.M.*, viii, p. 542], leaf spot (*Cercospora beticola*) [ibid., xiii, p. 415], and curly top [ibid., xiii, p. 285]. The paper concludes with an account of the results obtained in tests of promising strains, seed-production studies, and other agronomic investigations.

Rapport (1933) van de Commissie ter bevordering der Suikerbietenteelt te Groningen. [Report for 1933 of the Commission for the promotion of Sugar Beet cultivation at Groningen.] —*Meded. Inst. Suikerbietenteelt*, 3, pp. 23–72, 5 figs., 1934.

Three types of the yellowing disease of beets [*R.A.M.*, xiii, p. 10] are described on pp. 53–54 of this report. The first is a pronounced discoloration, chiefly of the apical parts of the oldest leaves, uniformly distributed throughout the field. The disturbance is most prevalent on sandy and light clay soils, and may be combated by heavy applications of nitrogen, with the absence of which it is evidently correlated.

Yellowing proper is not nearly so common as the foregoing, and its cause remains obscure. The condition may be observed at the end of July and beginning of August, and is characterized by yellowing of the older leaves with the exception of a green strip beside the veins. The affected foliage becomes brittle in contrast to the flaccidity of that affected by the preceding type.

A temporary mottling of the leaves in early July is also of uncertain origin.

Sattar (A.). **A comparative study of the fungi associated with blight diseases of certain cultivated leguminous plants.**—*Trans. Brit. Mycol. Soc.*, xviii, 4, pp. 276-301, 2 figs., 3 graphs, 1934.

A detailed account is given of the author's investigation of the following fungi associated with diseases of cultivated leguminous plants, namely, a strain of *Ascochyta pisi* [*R.A.M.*, xii, p. 740] isolated from pea stem lesions in the Punjab, India, and two strains obtained from pea pod lesions in London and from stem lesions at Windsor, respectively; a weakly parasitic form of *A. pinodella* [ibid., xii, p. 609] from pea leaf lesions associated with *A. pisi* in the Punjab; two *Ascochyta* forms, considered to be varieties of

A. pisi, isolated from pod lesions of wild vetch (*Vicia sativa*) in England, and from pod lesions of lentils in the Punjab, respectively; a fungus from stem and pod lesions of gram (*Cicer arietinum*) in the Punjab; *Phyllosticta* [*A.*] *rabiei* [ibid., xiii, p. 346] from gram stem lesions from Spain; and two cultures each of *Mycosphaerella pinodes* [ibid., xii, p. 609] and *A. pinodella* obtained from the Centraalbureau voor Schimmelcultures in Baarn. Cultural studies and inoculation experiments in the greenhouse and in the field indicated that the English and Indian strains of *A. pisi* had the same host reactions, and that they are distinct from *M. pinodes* and *A. pinodella*, the only two species which were found to cause severe root rot; the Indian fungus from gram was found to be identical with *P. rabiei*, and finally the indications were that all the fungi studied, except *M. pinodes* and *A. pinodella*, are largely specialized each to its own host.

In dealing with the systematic position of *P. rabiei*, it is pointed out that it differs from *A. pisi* in having shorter spores (9 to 10 as against 12·5 to 13·5 μ), but that under conditions of high humidity and on plants at a certain stage of development, the spores of *P. rabiei* may reach the average size of those of *A. pisi*, the whole range of sizes varying from 6 to 15 by 3 to 6·5 μ in the Indian specimens and from 6 to 16 by 3 to 6·5 μ in the Spanish specimen studied by the author. As regards septation, all the fungi investigated fall into three classes: (1) with most of the spores one-septate, namely, the Indian and English strains of *A. pisi*, the two varieties from wild vetch and lentils, and the pycnidial stage of *M. pinodes*; (2) with one-septate spores present in fair numbers, but with a preponderance of non-septate spores, namely, *A. pinodella*; and (3) with one-septate spores practically absent, namely, the weakly parasitic form of *A. pinodella* from pea leaf lesions, and *P. rabiei*. The last-named fungus, in particular, whether growing on its host or in culture, generally shows a very small percentage (less than 2) of bicellular spores; actual counts made in India showed that under dry weather conditions the percentage of non-septate spores was 99·6, while under very moist conditions the percentage of bicellular spores was as high as 5. It was further shown that the Indian and Spanish strains of *P. rabiei* reacted differently at germination according to the medium, producing a high percentage of one-septate spores (90 and 83, respectively) only in acid media (N/25 malic acid). For all these reasons, and more especially because the spores of this fungus mostly become bicellular when taken from the host plant and germinated, the author upholds Labrousse's determination of this fungus as *Ascochyta rabiei* [ibid., xi, p. 344].

WENT (JOHANNA C.). **Fusarium-aantastingen van Erwten.** [*Fusarium* infections of Peas.]—Thesis [University of Utrecht (Hoeijenbos & Co., Utrecht)], 83 pp., 10 figs., 7 graphs, 1934. [English summary.]

A comprehensive, tabulated account is given of the writer's studies on the so-called 'St. John's disease' ('St. Johanniskrankheit') [*R.A.M.*, v, p. 530] of peas which causes heavy losses each year in Zeeland, the affected plants turning yellow and dying

prematurely. Van Hall, who investigated the disease during 1902–3, isolated from infected plants in Zeeland, Friesland, and Utrecht a fungus which he identified as *Fusarium vasinfectum* var. *pisi* (*Ber. Deutsch. Bot. Gesellsch.*, xxi, 1903). From the writer's experiments [full details of which are given] it would appear that the disease may be caused by several species of *Fusarium*, the most virulent symptoms being induced by *F. solani* var. *striatum*, *F. solani* var. *martii* [*R.A.M.*, xiii, p. 128], and *F. oxysporum*, while those due to *F. solani* var. *medium*, *F. equiseti*, *F. herbarum* [ibid., xii, pp. 278, 492], *F. herbarum* var. *viticola*, and *F. anguioides* [ibid., xi, p. 17] were less severe. The pathogenicity of the fungi was enhanced by copious watering of the plants shortly after inoculation. It is obvious, moreover, that the course of the disease is largely influenced by temperature, but the exact part played by this factor has yet to be determined. None of the five varieties tested showed an appreciable degree of resistance to *Fusarium* infection.

Inoculation experiments with *F. culmorum* resulted in an immediate wilting of the pea plants quite distinct from the gradual decline characteristic of 'St. John's disease', and evidently attributable rather to injury from the secretions of the fungus than to actual penetration by the latter. Confirmation of this view was obtained by placing cut and rooted plants in a filtrate of the organism from Richards's solution, under which conditions wilting and root rot take place within 24 hours. The fungus was recovered from the cortex of the tap-root and was also present to a small extent in the vascular bundles. The symptoms in one of the fields from which *F. culmorum* was isolated agreed with those induced by artificial inoculation, suggesting that this fungus is implicated in some measure in the wilting.

The various species of *Fusarium* associated with wilting effect their entrance into the plants in exactly the same way, although the resultant discoloration varies considerably according to the organism. The most rapid and conspicuous discoloration was produced by the relatively weak parasites *F. herbarum* and its var. *viticola*, followed by *F. solani* vars. *striatum* and *martii* and *F. culmorum*, while *F. oxysporum* and *F. equiseti* caused practically no darkening of the root system. Thus, a marked discoloration is not necessarily correlated with a high degree of toxicity. No trace of fungal development in the root cells was apparent at the first sign of discoloration, which is evidently an expression of host reaction to the secretions of the pathogen. The fungi under observation proved capable of penetrating into the root hairs and epidermal cells without wounding. Numerous protuberances are formed on the inner cell wall where the hyphae pass into the two cortical cell layers next to the outermost [cf. ibid., xi, p. 243]. In cases of advanced infection the mycelium spreads from the cortical cells into the vessels, principally by way of the bordered pits.

BREMER (H.). **Die Mehlkrankheit der Zwiebeln.** [The flour disease of Onions.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xiv, 4, pp. 37–38, 3 figs., 1934.

A brief, popular note is given on the so-called 'flour disease' of

onions due to *Sclerotium cepivorum* [*R.A.M.*, xiii, p. 558], which is stated to be widespread in Germany though apparently not hitherto reported from that country. No connexion could be traced between the sclerotia of *S. cepivorum* and those of a *Botrytis* commonly found on onion bulbs. The 'flour disease' is scarcely likely to assume epidemic proportions in Germany, where it may be expected, judging by its prevalence under the maritime climatic conditions of Great Britain, to occur mainly in damp summers. It may, however, prove to be a source of considerable loss and should be combated chiefly by a well-regulated rotation in which onions are excluded from infested fields for at least eight to ten years.

Bremer (H.) & Nicolaisen (A.). **Die häufigsten Krankheiten und Schädlinge der Küchenzwiebeln.** [The most prevalent diseases and pests of kitchen Onions.]—*Biol. Reichsanst. für Land- und Forstw. Flugbl.* 130, 4 pp., 7 figs., 1934.

Popular notes are given on the symptoms, etiology, and control of some common diseases of onions in Germany, namely, *Tuburcinia cepulae* Liro [*Urocystis cepulae* Frost], causing a seedling blight and constantly reinfesting the soil by means of its innumerable minute, black spores from the leaves and scales; flour disease (*Sclerotium cepivorum*) [see preceding abstract]; downy mildew (*Peronospora schleideni*) [*R.A.M.*, xii, p. 484], frequently associated with the black spotting due to *Macrosporium parasiticum* [*Pleospora herbarum*: ibid., x, p. 219]; *Botrytis* rot; and slime ('Rotz') disease [ibid., xiii, p. 5].

Elssmann (E.). **Bekämpfung der Septoria-Blattfleckenkrankheit des Sellerie.** [The control of the *Septoria* leaf spot disease of Celery.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xliv, 4, pp. 192–205; 5, pp. 209–222, 1 fig., 1934.

A full account is given of three years' experiments (1930–2) at the Weihenstephan (Bavaria) Horticultural College and Research Institute in the control of celery leaf spot (*Septoria apii*) [*R.A.M.*, xii, p. 747 and next abstract] by the application of 1 per cent. Bordeaux mixture. The variety used in the tests was the Limburg celeriac.

Considerable benefit was derived from three or four applications of the fungicide both as regards elimination of infection and increase of yield, though the latter factor varied a great deal in the different years. In 1930, for instance, the yield of marketable celeriac was increased by 41·9 per cent. as a result of three treatments, in 1931 by 24·6 and 36·9 per cent. (three and four applications, respectively), and in 1932 by 57·2 and 114·8 per cent. (two and three, respectively). These discrepancies may be largely explained on a meteorological basis. In damp weather the plants, though extensively attacked by the fungus, generally remain fresh for a long time, whereas a dry, warm spell that checks the spread of infection may result in the rapid desiccation and death of the invaded leaves. Wacker's Bordeaux mixture [ibid., xiii, p. 449], though equally effective with the standard preparation as a fungicide, did not produce such heavy increases of yield as the latter. At a market price of M. 8 per cwt. the profit from spraying (three

applications) in 1931 was 13·9 and 22·3 per cent. for Wacker's and standard Bordeaux, respectively, while in 1932 the corresponding figures for two and three applications of the latter were 55·4 and 103·2 per cent., respectively.

SCHMIDT (E.). **Was können wir gegen die Blattkrankheit des Selleries tun?** [What can we do against the leaf disease of Celery?]—*Obst- und Gemüsebau*, lxxx, 5, p. 72, 1934.

In the Basel district of Switzerland the leaf blight of celery (*Septoria apii*) [see preceding abstract] may be prevented by seed disinfection with uspulun, tillantin dust, or copper sulphate (20 gm. per l. water); sprinkling the hotbed with 0·5 per cent. uspulun; regular crop rotation and plentiful manuring with potash, nitrogen to be sparingly applied; and repeated treatments of the stand with 1 to 2 per cent. Bordeaux mixture from June to August. Should infection develop in spite of all precautions, watering the plants from above should be discontinued and the water (mixed with potash or nitrophoska) carefully applied to the soil with a can or hose. If necessary two supplementary applications of 2 per cent. Bordeaux mixture at a 10- to 14-day interval may be given after the removal of the diseased leaves. Similar measures are effective against rust (*Puccinia apii*) [*R.A.M.*, xiii, p. 73].

CHU (V. M.). **Notes on the presence of Sclerotinia miyabeana in China, with special reference to the comparison of this fungus with Sclerotinia arachidis.**—*1932 Year Book Bureau of Entom.*, Hangchow, China, pp. 1–58, 8 pl., 1933. [Chinese summary. Received 1934.]

Stem rot of groundnuts in Japan is caused by two species of *Sclerotinia*, *S. miyabeana* and *S. arachidis*, described by Hanzawa in 1911. The principal morphological difference between these two species lies in the character of the sclerotia, which in *S. miyabeana* consist of a thick, dark brown rind and a colourless, loosely constructed medulla; they are readily detachable from the substratum, and present at maturity a hard, black, verrucose appearance. The sclerotia of *S. arachidis* are smooth, lustrous, finely punctate, composed of a colourless, compact medulla surrounded by a thin, brownish-black rind, and they are firmly attached to the substratum. The length ranges from under 1 mm. to over 1 cm. in both species. The asci of *S. miyabeana* measure 115 to 163 by 7·5 to 10 μ and the ascospores 10 to 14·2 by 4·5 to 7·5 μ, the corresponding dimensions for *S. arachidis* being 110 to 150 by 7 to 10 μ and 9 to 16 by 5·5 to 7·5 μ, respectively. The aerial mycelium of *S. miyabeana* is snow-white, of dense texture and irregular growth, contrasting with the whitish to greyish, loosely woven, and regular mycelium of *S. arachidis*. The conidiophores of the latter form a dense layer of the *Botrytis* type and may be from 450 μ to nearly 5 mm. high, the numerous pale sepia, ovoid or elliptical conidia being from 7 to 16 by 7 to 10 μ in diameter. Conidia were not observed in *S. miyabeana*, which produces ascocarps in much greater profusion than the other species and can also withstand a higher temperature (up to 33° as compared with 27° C.); a further means of separation is afforded by the colour of

the lesions on the host, those due to *S. miyabeana* being purplish brown to dark, eventually shade-brown and those of *S. arachidis* of a variable tinge of brown rapidly becoming black. A fungus destroying groundnut pods in Sanshi, north China, in 1929 was found to agree in all essential features with *S. miyabeana*.

Under dry conditions the mycelia of the two stem-rotting fungi may persist for at least eight months in the crop débris. All parts of the host may be attacked, the pods frequently containing sclerotia and the seeds being thinly coated with a velvety mycelial layer that develops abundantly in the presence of moisture. The optimum temperature for mycelial growth in both fungi is 20° to 25°. Spore infections by both fungi were found to occur solely through wounds, except on the flower petals, but the mycelium and germinating sclerotia are capable of invading uninjured tissues. Both species require plentiful moisture and a suitable temperature (19° to 25°) to cause infection; the incubation period varies from 36 hours to ten days with the method of inoculation, source of infection, and environmental conditions.

Other natural hosts of the two *Sclerotinia* species under observation include *Mazus japonica* [*M. rugosus*] and *Oxalis corniculata*; *S. arachidis* has further been found on celery, *Erigeron annuus*, *Panicum sanguinale* var. *ciliale*, and *Veronica polita* [*V. didyma*], while *S. miyabeana* occurs spontaneously on *Gnaphalium multiceps* [*G. luteo-album*] and radish. Inoculation experiments with both fungi were successful on lucerne (weak infection by *S. arachidis*), peas, clover (*Trifolium pratense* and *T. repens*), and broad beans, *S. arachidis* again being only feebly pathogenic on the last-named. Celery and eggplant reacted positively to inoculation by *S. arachidis* and *S. miyabeana*, respectively. In field trials, the Wensui variety from northern China proved the most susceptible among 27 tested to the attacks of both organisms; Lakuda and American from Japan remained immune from both; while Amoy and Unchow, from south China, were severely attacked by *S. arachidis*, but only mildly by *S. miyabeana*.

RANGHIANO (D.). **Recherches cytologiques sur le 'court-noué' de la Vigne.** [Cytological studies on 'court-noué' of the Vine.]—*Arch. Roum. Path. Expér. et Microbiol.*, vi, 4, pp. 353–495, 23 pl., 26 figs., 1933.

The writer has made a thorough study at the Montpellier Agricultural College, France, of court-noué of the vine, his thesis having been submitted to the Faculty of Sciences a fortnight before the publication of the paper by Viala and Marsais attributing the disease to *Pumilus medullae* [*R.A.M.*, xiii, p. 422].

The study of court-noué is stated to have occupied French and foreign scientists for about a century. Among the numerous synonyms applied to the disease [cf. ibid., xiii, p. 492] may be mentioned 'brûlure organique', 'carniure', 'gommose bacillaire', 'gélivure', and 'maladie de Californie' (*Plasmodiophora californica*: *Journ. de Bot.*, p. 378, 1892).

Generally speaking, the writer's comparative cytological examination of healthy and diseased Aramon, healthy Clinton, and diseased Taylor vine buds revealed no very striking discrepancies

between the two lots of material, apart from the deficiency or absence of starch and the cellular disorganization in the older tissues of the affected specimens. A more important feature of both healthy and diseased, European and American, vines is the presence in the roots (as already noted by Rives and others) of an abundant mycelium presenting all the characters of a mycorrhizal endophyte [ibid., iii, p. 500]. Rives, however, failed to trace the fungus beyond the endodermis, whereas in the present observations the mycelium was detected in the parenchyma of the vascular bundles and the medulla. In roots with the symptoms of court-noué, histocytological modifications are apparent, with abnormal, mitotic and amitotic nuclear division, frequent crushing of the cellular membrane, intensive plasmolysis of the cytoplasm, and sometimes hypertrophy of the cells, nuclei, and especially of the nucleoli. These changes are associated with an accumulation of hyphae, in the form of arbuscles, in the cells of the cortical parenchyma. In healthy vines these hyphae undergo extensive phagocytosis, whereas in the diseased tissues they extend down to (but not into) the xylem. In the stems of healthy vines hyphae have been found localized in the subepidermal, endodermal, and vascular regions of the shoots, while all the tissues and cells (again with the exception of the wood) are invaded in those of diseased plants. Similar conditions were observed in the leaves, flowers, seeds, and pips. In the shoots the filamentous form with hyphae 1·5 to 6 μ in diameter prevails, arbuscles, vesicles, and sporangioles being of rare occurrence. The Aramon variety appears to be specially susceptible to mycorrhizal invasion (as distinct from the normal symbiotic relationship), and its gradual disappearance, at any rate from the plains, is believed to be only a matter of time. The change from the symbiotic to the parasitic habit in the endophyte is accompanied by a fatty degeneration of the host tissues.

A bibliography of 87 titles is appended.

Stummer (A.). **Eine seltene Rebkrankheit im mährischen Weinbaugebiete.** [A rare Vine disease in the Moravian viticultural region.]—*Das Weinland, 1933*, p. 15, 1933. [Abs. in *Neuheiten auf dem Geb. des Pflanzensch.*, xxvii, 3, p. 62, 1934.]

In 1931–2 vines at Irritz, south Moravia, were destructively attacked by *Cladosporium* [*Cercospora*] *roesleri* [*R.A.M.*, ix, p. 504], which produced a velvety, greenish-brown efflorescence, mostly on the under side of the leaves. From early July onwards the desiccation of the foliage progresses rapidly in an upward direction. No means of control are known.

Rossi (A.). **Osservazioni sulle infezioni peronosporiche nel territorio di Parenzo nell' annata 1933.** [Observations on Vine mildew in the vicinity of Parenzo in the year 1933.]—*L'Istria Agric.*, N.S., xiv, 8, pp. 179–180, 1934.

In 1933, only late, relatively light outbreaks of vine mildew [*Plasmopara viticola*] occurred at Parenzo, Istria, but in parts of the neighbouring plains attacks developed on 4th May. Following a drop in temperature to between 5° and 8° C. on 16th–20th May attack was general on young leaves by 28th. In June infection was

arrested but was renewed in July following rains, the fruit clusters being affected. August was mainly fine and the last outbreaks, in September and October, were severe only on new leaves. Treatment consisting of three spray and four dust applications (about one-half the usual number) carried out in accordance with warnings issued [cf. *R.A.M.*, xii, p. 73] gave very satisfactory results.

VENKATARAYAN (S. V.). **Downy mildew of the Grape-Vine.**—*Mysore Agric. Calendar 1934*, pp. 52–53, 1 pl., 1934.

After a brief note on the symptoms of downy mildew of the vine [*Plasmopara viticola*: *R.A.M.*, xiii, p. 7] the author states that in Mysore the disease appears during the rains of the north-east monsoon, so that spraying should be effected during September–October. Three applications may be necessary, the cost of which (chemicals and labour) per plant amounts to only one anna [slightly over one penny] or less each application.

BITANCOURT (A. A.). **Relação das doenças e fungos parasitas observados na secção de fitopatologia durante os anos 1931 e 1932.** [Report on the diseases and parasitic fungi observed in the phytopathological section during the years 1931 and 1932.]—Reprinted from *Arq. Inst. Biol. Defesa Agric. e Animal*, v, 12 pp., 1934. [English abstract.]

A list is given of the fungous, bacterial, virus, and physiological diseases affecting citrus, banana, coffee, cotton, fruit and vegetable crops, ornamentals, and miscellaneous plants in São Paulo, Brazil, during 1931–2.

BOURIQUET (G.). **Madagascar: list of the parasites and diseases of cultivated plants.**—*Internat. Bull. of Plant Protect.*, viii, 5, pp. 99–100, 1934.

A supplementary list is given of diseases of parasitic, virus, or obscure origin, observed since October, 1924, affecting cultivated plants in Madagascar [cf. *R.A.M.*, x, p. 699], of which the following may be mentioned: *Corticium salmonicolor* on apple [ibid., x, p. 586]; *Phytophthora* (?) *jatrophae* [ibid., x, p. 755] on *Vanilla* [*planifolia*]; mosaic of sugar-cane; *Fusarium* wilt of rice; 'kroepoek' [leaf curl] of tobacco [ibid., xi, p. 478]; and *Bacterium solanacearum* on groundnuts [ibid., xi, p. 123 *et passim*].

ROGER (M.). **Le cancer chez les végétaux.** [Cancer in plants.]—*Bull. Assoc. Française pour l'Avancement des Sciences*, lxiii, 122, pp. 341–349, 1934.

In this paper a popular account is given of crown gall (*Bacterium tumefaciens*) with special reference to the parallel which has been suggested to exist between this disease and animal cancer [*R.A.M.*, xiii, p. 426].

GREANEY (F. J.). **Field experiments on the prevention of cereal rusts by sulphur dusting (1930–1932).**—*Scient. Agric.*, xiv, 9, pp. 496–511, 1 fig., 2 graphs, 1934. [French summary.]

The results of continued experiments from 1930 to 1932, inclusive, in Manitoba on the control of stem [black] and leaf

[brown] rusts of wheat (*Puccinia graminis* and *P. triticina*) and crown rust (*P. coronata avenae*) [*P. lolii*] and black rust of oats by dusting with sulphur [*R.A.M.*, vii, p. 565; xii, p. 504; xiii, p. 498] showed that all the rusts were almost completely checked in each of the years under survey by relatively light (30 lb. per acre) applications of sulphur dust, at intervals of five days spread over a dusting period of four or five weeks. This treatment significantly improved both yield and quality of the grain. In 1930, a severe rust year, the yield of Marquis wheat was increased by 24·3 bushels per acre or approximately by 400 per cent., while the quality (grade) of the grain was improved from 'feed' weighing 40 lbs. to '1 northern' weighing 60 lb. per bushel. In the same year the yield of Victory oats was increased by 45 bushels or about 153 per cent. per acre.

The best results were obtained with kolodust [ibid., xiii, p. 528], and in general it was noticed that the efficacy of the dust increased in proportion to the fineness of division, but very satisfactory results were also obtained with medium grades of sulphur.

Rudorf (W.) & Job (Maria). **Untersuchungen bezüglich der Spezialisierung von Puccinia graminis tritici, Puccinia triticina und Puccinia glumarum tritici, sowie über Resistenz und ihre Vererbung in verschiedenen Kreuzungen.** [Studies of specialization in *Puccinia graminis tritici*, *P. triticina*, and *P. glumarum tritici*, and of resistance and its inheritance in various crosses.]—*Zeitschr. für Züchtung*, A, xix, 3, pp. 333–365, 1934.

The authors state that under the conditions prevailing in the Argentine, wheat brown rust (*Puccinia triticina*) affects grain quality less than the black and yellow rusts (*Puccinia graminis tritici* and *P. glumarum tritici*), as it reduces the number of grains in the ear rather than their specific weight. Specialization studies [considerable details of which are given] of the black rust on Stakman's and Levine's differential wheat varieties [*R.A.M.*, xiii, p. 566] showed the prevalence in the different years of different physiologic forms of the rust, none of which could be identified with any other form so far found in America or Europe. The abundant occurrence in Argentina of barberry bushes, especially *Berberis buxifolia*, is considered to favour the production in nature of new physiologic forms of the rust. The results of tests for resistance of a number of wheat varieties agreed well with those obtained in North America; Hope, in particular, showed the same high resistance in an advanced stage of growth in the field, while exhibiting high susceptibility in the seedling stage in the greenhouse.

Tested on Mains's differential hosts [ibid., v, p. 477; xii, p. 151] brown rust spore collections from three different origins showed four different groups of physiologic forms, among which forms A and E appeared to be identical with Johnston's and Mains's forms 5 and 9. The varieties Riccio, Ardito, Fultz, and Chargorod proved to be resistant to this rust both in the greenhouse and in the field. The behaviour of Carina, Brevit, Webster, Mediterranean, Demokrat, and Kawvale varied from year to year,

according to which physiologic form predominated, but they appear to be resistant to many of the forms.

The varieties Chinese 165 and 166, Roter Sommerkolben, Heines Kolben, Garnet, and Golden Drop were shown to be resistant to yellow rust both in the greenhouse and in the field, while Mentana and Riccio were susceptible in the seedling stage but highly resistant in the field. Comparative inoculations on 11 differential wheat varieties with Argentine and European yellow rust inocula under controlled temperature conditions indicated that none of the 14 European biologic forms so far known [ibid., xii, pp. 272, 557; xiii, p. 567] occurs in the Argentine.

Studies on the inheritance of resistance to the three rusts indicated that while it is governed by Mendelian laws, no hard and fast rule could be determined as to whether resistance was dominant or recessive.

The climatic conditions at Santa Catalina, where the experiments were carried out, are so favourable for the development of the three rusts that it was possible in field tests to determine varietal reaction to all three. Several of the crosses that were studied gave promise of resistance to two or all three rusts, partly linked with resistance to loose smut (*Ustilago tritici*) and early maturity.

Garbowski (L.) & Juraszkowna (Mme H.). **Essais d'identification des formes biologiques de la rouille Puccinia graminis tritici, provenant du territoire de Pologne. (Note préliminaire).** [An attempt at the identification of the biological forms of the rust *Puccinia graminis tritici*, originating from the territory of Poland. (Preliminary note).]—*Rev. Path. Vég. et Ent. Agric.*, xxi, 1, pp. 45–55, 1 pl., 1934.

The year 1932 is stated to have been one of serious outbreaks in Poland, as well as in other countries to the south and south-east, of black rust of wheat (*Puccinia graminis tritici*) [*R.A.M.*, xii, p. 681] which hitherto had been considered of minor economic importance, in contradistinction to black rust of rye (*P. g. secalis*) which has rendered the cultivation of rye impossible in certain regions of Poland. There were indications that the wheat rust had been brought by air from outside the country, the intensity of the disease decreasing in districts to the north and north-west, though even there infection occasionally was as high as 80 to 100 per cent. The development of the rust was greatly favoured by adverse weather conditions during the preceding autumn and the early spring of 1932, which considerably retarded the normal growth of the wheat.

One of the outstanding features of the epidemic was that varieties which heretofore had been considered to be highly resistant to the rust, e.g., Pulawska Twarda, were severely attacked for the first time. Cross inoculations of the form isolated from the Pulawska Twarda variety and cultured on Stakman's and Levine's differential varieties [see preceding abstract] showed that except for some minor quantitative differences this form agreed with the American physiological form 40. The results of similar tests with a collection from the Podolanka variety in 1933 in Volhynia showed that it was identical with form 15. The fact

that no barberry bushes could be found in the vicinity of the infected wheat fields is considered to indicate that both forms 15 and 40 were introduced into Poland from outside.

WATERHOUSE (W. L.). **Australian rust studies. IV. Natural infection of Barberries by black stem rust in Australia.**—*Proc. Linn. Soc. New South Wales*, lix, 1–2, pp. 16–18, 1 pl., 1934.

A brief account is given of the first discovery in Australia in December, 1933, on barberry bushes growing under natural conditions at Yetholme, New South Wales, of spermogonia and aecidia of a rust which, when propagated and tested on Stakman's and Levine's differential wheat varieties [see preceding abstract], proved to be physiological form 34 of *Puccinia graminis tritici* [ibid., x, p. 367]. The same form was also found on *Agropyron scabrum* growing intermixed with the barberries, which were doubtless infected by the abundant teleutospores from the old stems of this grass. The rust was further found of *A. scabrum* growing at a considerable distance from the barberries.

Special importance is attached to this discovery, as it indicates the advisability of the eradication of all species of barberry susceptible to the rust, in view of the fact that form 34 is highly heterozygous and might easily give rise on this host to new physiological forms, a factor which would considerably complicate the problem of breeding wheat varieties resistant to black rust in Australia.

RUDORF (W.) & ROSENSTIEL (K. v.). **Untersuchungen über die Widerstandsfähigkeit bei Weizensorten gegen Weizenflugbrand, Ustilago tritici, und über ihre Vererbung in Kreuzungen.** [Studies on the resistance of Wheat varieties to loose smut, *Ustilago tritici*, and on its inheritance in crosses.]—*Zeitschr. für Züchtung*, A, xix, 3, pp. 324–332, 1934.

Out of a total of 86 [listed] varieties of wheat which were tested in 1930 and 1931 in La Plata [Argentina] for resistance to loose smut (*Ustilago tritici*), twenty-nine (including 38 M.A., Marquis, Garnet, Hope, and Hussar) were found to be completely immune from the disease. The fact that different physiologic forms of the smut could not be distinguished in artificial inoculations on several susceptible (e.g., San Martin, and Triunfo) and resistant (e.g., Duro Capa Klein, 38 M.A., and Chinese 466) wheat varieties with inocula of different geographical origins would suggest that the immune varieties tested are resistant to several forms, a fact which is of considerable importance for the production of immune varieties. The behaviour of the F_3 generation of a cross between the susceptible San Martin and the resistant 38 M.A., obtained from F_2 plants artificially inoculated in the ear, indicated that the resistance of 38 M.A. is probably dependent on three recessive factors. All the susceptible varieties tested, as well as the segregating lines of the above-named cross and of another one, showed a very high percentage of attack by the smut, a fact leaving little doubt that in those varieties in which the disease failed to develop resistance is inheritable.

Tingey (D. C.) & Tolman (B.). **Inheritance of resistance to loose smut in certain Wheat crosses.**—*Journ. Agric. Res.*, xlviii, 7, pp. 631–655, 3 figs., 1 graph, 1 map, 1934.

This is a detailed account of the authors' genetic studies [the results of which were checked by statistical methods] in Utah of the inheritance of resistance to loose smut (*Ustilago tritici*), character of awns, and colour of grain and chaff in the Hope C.I. 8178 × Federation, Hope × Dicklow No. 3, and Preston C.I. 3081 × 01 24 C.I. 11542 wheat crosses, in which Hope was shown in preliminary tests to be immune from the smut, 01–24 resistant, Dicklow No. 3 was possessed of a fair degree of resistance, and Federation was highly susceptible. The *U. tritici* inoculum used was obtained from the Dicklow variety in Utah, where it apparently occurs also on Federation and Sevier, and the pathogenicity of which gave indications in preliminary trials of being comparatively uniform. In the artificial inoculation experiments, maximum infection was obtained only when the smut spores were placed directly on the stigmas, and there appeared to be little or no difference in the amount of infection resulting from inoculations at the time when the stamens were rather green and immature or when the plants were in full bloom, and the pollen was being shed.

The statistical study of the behaviour of the F_3 generation of the various crosses indicated that at least three factors, R_1R_1, R_2R_2, and R_3R_3, were involved in the inheritance of resistance to loose smut, each of which is believed to have a different effect, an individual with the R_2R_2 factor showing somewhat more resistance than one with the R_3R_3 factor, and one with the R_1R_1 factor being about as resistant as one possessing the other two factors. It is pointed out that this does not mean that the factors have definite numerical values with specific expression, regardless of the genotype, as factor interaction is not an uncommon phenomenon. On this basis, Hope which was never smutted in spite of the large number of inoculated plants which were grown, is considered to be completely immune and to possess all three factors in the dominant condition, though dominance is evidently incomplete and the factors have a cumulative effect. Preston proved to be highly resistant and is assumed to possess the first two factors and to lack the third. 01–24 is assumed to possess the last two factors and to lack the first, while Dicklow No. 3 which was apparently more susceptible than 01–24 is assigned only the last factor R_3R_3, lacking the other two, and Federation is assumed to possess none of the factors for resistance.

There was no evidence in the studies of any relationship between the morphological characters of the varieties and their resistance to loose smut.

Angell (H. R.). **A preliminary note on the recognition of flag smut or bunt infection based on the deformation of seedlings.** —*Journ. Australian Council Sci. & Indus. Res.*, vii, 2, pp. 110–112, 2 pl., 1934.

A brief account is given of laboratory experiments at Canberra, Australia, the results of which showed that infection of young

wheat seedlings, at the moment when the majority of the coleoptiles are ruptured, with flag smut (*Urocystis tritici*) or bunt [*Tilletia caries* and *T. foetens*] can be recognized by the characteristic twisting and inclination of the infected seedlings in contrast to the almost invariably straight and erect habit of the controls under the environmental conditions described. These results are considered to offer an easy and time-saving method for a more accurate determination than hitherto possible of the total amount of infection with these diseases, and also for the differentiation in wheat varietal tests between resistance to infection and resistance to development of the disease. It is pointed out in passing that attack by species of *Fusarium* was much more apparent among the infected seedlings than among the controls.

Gaudineau (Mlle [M.]). **La carie du Blé en 1932–1933.** [Wheat bunt in 1932–1933.]—*Rev. Path. Vég. et Ent. Agric.*, xxi, 1, pp. 56–66, 1 graph, 1934.

Sowing experiments with the Bon Fermier and Florence 135 wheat varieties, conducted on the same lines as in previous years [*R.A.M.*, xii, p. 429], indicated that in 1932–3 the conditions for infection of the seedlings with bunt [*Tilletia caries*] were more favourable during the autumn than in the spring, a result which, taken in conjunction with previous ones, is considered to be typical for the vicinity of Paris. Further tests confirmed those of the preceding year [loc. cit.] in regard to the reaction of the various species and varieties of wheat which were tried, and also showed that the Swiss wheat Baulmes is resistant and that *Triticum dicoccoides* is susceptible to bunt under the local conditions. Differences in virulence were again found between bunt inocula of diverse origin, collections from Breslau and Cosel being the most virulent among those tested in 1933 [cf. ibid., xiii, p. 293].

Oversigt over Plantesygdomme. 197.—Vintermaanederne og April 1934. [Survey of plant diseases. 197.—Winter months and April, 1934.]—*Statens Plantepatol. Forsøg*, 5 pp., 1934.

O. Nielsen states that *Cercosporella herpotrichoides* was found in three places in Denmark in the early part of 1934, causing foot rot of wheat.

Nisikado (Y.), Matsumoto (H.), & Yamauti (K.). **Studies on a new Cephalosporium, which causes the stripe disease of Wheat.**—*Ber. Ōhara Inst. Landw. Forsch.*, vi, 2, pp. 275–306, 7 pl., 1934.

A detailed, tabulated account is given of the writers' investigations on the so-called 'stripe' disease of wheat in the provinces of Okayama and Kagawa, western Japan, caused by a new species of *Cephalosporium*, *C. gramineum* Nisikado et Ikata, a complete technical description of which is given in English, supplemented by an abbreviated Latin diagnosis.

In the early stages (end of February or beginning of March) the *Cephalosporium* disease is reminiscent of the yellow type of wheat

mosaic [*R.A.M.*, x, p. 647]. About a month later the lesions assume an aspect resembling those of stripe disease (*Helminthosporium gramineum*) on barley. One or two, rarely up to four, continuous, yellowish-brown stripes are formed on the leaf blades, sheaths, and culms. By the end of May the symptoms are acute, and this phase is suggestive of take-all [*Ophiobolus graminis*], the affected plants being barely able to produce viable ears and showing a tendency to die off. The vascular bundles in the diseased areas turn yellowish-brown and the spiral and pitted vessels, in particular, contain numerous hyphae and conidia. The fungus overwinters chiefly on infected wheat straw and stubble, but is also perpetuated to some extent through contaminated soil and on seed. In addition to wheat, barley, wild oats (*Avena fatua*), and other Gramineae are affected by the disease and present in general similar symptoms, though the injury to barley is less severe. The mycelium of *C. gramineum* consists of tangled hyphae, 1·5 to 4 μ wide (average 2 μ); the simple conidiophores, 5 to 20 by 1·5 to 4 μ, bear at their apices capitate agglomerations of hyaline, long-elliptical to ovoid, continuous, usually biguttulate conidia, 5 to 10 by 1·5 to 3 μ. The fungus grows well on various standard media. The minimum, optimum, and maximum temperatures for growth are about 6°, 20° to 24°, and 29° to 30° C. Development occurs at a hydrogen-ion range from below P_H 4 to P_H 9.

Wheat seed-grain inoculated from cultures of *C. gramineum* germinated more slowly and in lesser percentage than the controls, the seedlings were stunted, root development impeded, and the characteristic leaf symptoms induced. The fungus was present in the leaf vessels and was successfully reisolated.

Control measures should include crop rotation, destruction of infected refuse, late sowing (after December), selection of resistant varieties, and possibly seed and soil disinfection, experiments in which are to be undertaken.

Crosier (W.). **Abnormal germination in dusted Wheat.**—*Phytopath.*, xxiv, 5, pp. 544–547, 1 fig., 1934.

In July, 1932, a sample of Marquis wheat seed-grain treated with ceresan in March, 1931, and subsequently stored in a cool, dry place, gave abnormal results in laboratory germination tests, 13 per cent. developing short, thickened roots, 34 per cent. very misshapen plumules and roots, and 4 per cent. being dead. The injury is thought to have been accentuated either by the chipping or cracking of the seed coats, possibly during treatment, or by faulty storage conditions.

Pape (H.). **Federbuschsporenkrankheit des Weizens.** [The plumed spore disease of Wheat.]—*Deutsche Landw. Presse*, lxi, 21, p. 255, 1 col. pl., 1934.

Semi-popular notes are given of the symptoms, etiology, and control of the plumed spore disease of wheat and rye in Germany caused by *Dilophospora alopecuri* [*R.A.M.*, viii, p. 300], the losses from which in the Rhine Province may amount to as much as 80 per cent. in individual stands.

Bever (W. M.). **Effect of light on the development of the uredial stage of Puccinia glumarum.**—*Phytopath.*, xxiv, 5, pp. 507–516, 3 figs., 1934.

Within certain limits, various exposures to artificial light, supposedly comparable to different day lengths, induced little or no divergence in the expression of the infection type of *Puccinia glumarum* on Pannier, C.I. 1330 barley at temperature ranges of 45° to 50° and 55° to 60° F. [cf. *R.A.M.*, x, p. 714]. However, the six-hour day, compared with that of twelve hours, increased the incubation period by nine days. When the day length exceeded twelve hours there was a marked change of infection type from 4 (completely susceptible) to 0 (extremely resistant). A high light intensity (960 foot candles supplied by a 1,000-watt lamp) decreased the incubation period from 20 (ordinary daylight) to 11 days and promoted the subsequent development of the rust. A low light intensity (96 foot candles supplied by a 100-watt lamp) checked the full expression of the rust but failed to change the infection type, which was equally severe at all intensities. Uredospores produced under a low light intensity did not germinate in culture, but inoculation experiments with them gave positive results. At a temperature range of 68° to 70° F. the infection type was modified from 4 to 2 or 3 (moderately resistant or moderately susceptible), while above 80° no infection was secured.

Morwood (R. B.). **Covered smut of Barley.**—*Queensland Agric. Journ.*, xli, 3, pp. 236–240, 1934.

When barley seed affected with covered smut [*Ustilago hordei*: *R.A.M.*, xi, p. 505] was treated in Queensland in 1932 with formalin solution, tillantin R, and abavit B (2 oz. per bushel) the resultant infection when the crop was harvested was 0·2, 0·2, and 0 per cent., respectively, as compared with 7 per cent. in the untreated control plot. Laboratory examination showed that the formalin-treated seed deteriorated rapidly.

In 1933, single drill trials were made with various materials but the degree of infection was low. The results indicated that copper carbonate and tillantin R were only partially effective against *U. hordei* and that abavit B lost its efficiency when used at a lesser rate than 2 oz. per bushel. Formalin treatment (1 lb. to 30 galls.) did not reduce germination when the seed was planted in moist soil the following day.

Drill-sown plots were also laid down in 1933 with seed from a lightly smutted crop, cleaned and freed from smut balls and treated with copper sulphate solution (3 minutes in 1½ per cent.), abavit B (1 and 2 oz. per bushel), and formalin (10 minutes in 1 in 240). The amounts of infection that developed were, respectively, 0·23, 0·21, 0·02, and 0·02 per cent., as against 4·20 per cent. in the untreated controls.

Abavit B was easier to apply than formalin, had no detrimental effect on germination, could be applied at any time, enabled the treated seed to be stored indefinitely, avoided risk of recontamination by the fungus, and did not affect the rate at which the seed ran through the drill. The advantages of the formalin treatment

were that it was cheaper, and the treated seed was non-poisonous. Directions are given for applying both treatments.

Pape (H.) & Rademacher (B.). **Erfahrungen über Befall und Schaden durch den Getreidemehltau (Erysiphe graminis D.C.) bei gleichzeitigem Anbau von Winter- und Sommergerste.** [Experimental observations on attack and damage by the cereal mildew (*Erysiphe graminis* D.C.) in the simultaneous cultivation of winter and summer Barley.]—*Angew. Bot.*, xvi, 3, pp. 225–250, 2 figs., 1 diag., 1 map, 1934.

During the past two decades the cultivation of winter barley has considerably extended in Germany, the area under this crop in 1932 being 245,809 hect. as compared with 47,025 in 1913. In Schleswig-Holstein the summer barley crops suffer very severe damage from mildew (*Erysiphe graminis*) [*R.A.M.*, xii, p. 620] in the vicinity of diseased winter ones, up to 100 per cent. infection having been observed as early as 5th May, 1933, at which time there was hardly a trace of infection left on the adjacent winter stands. The conidia are wind-borne, summer barley in the line of the prevailing winds from diseased winter fields being particularly liable to attack, especially when the latter are on higher ground. This may be checked by wind-breaks of quickset hedges between the winter and summer fields. As observed in pot experiments, early mildew infection on summer barley causes a marked reduction of the grain and straw yields (as much as one half, according to information from Denmark, where similar conditions obtain), defective grain development, pronounced retardation of tillering and maturity, enhanced tendency to lodging, and premature death of a large number of plants.

The winter barley may contract mildew from volunteer plants of the summer crop; hence the importance of early ploughing-under to remove this source of infection. As a rule the effects of early outbreaks of mildew on the winter stand are less severe than on summer barley, but the dead leaves of the former constitute a good breeding ground for *Cercosporella herpotrichoides*, an agent of cereal foot rot [ibid., xiii, p. 568].

Reports of mildew transmission from winter to summer barley have been received from certain mountainous districts in central Germany in which the climatic conditions approximate to those of the maritime area. According to Danish statements, wind-borne infection may occur up to a distance of 1,000 m., and the writers have found that an intervening space of at least several hundred metres is necessary to ensure protection. The practice of growing a mixed crop of oats and summer barley reduces the spread of infection in the latter. In a series of varietal tests near Kiel in 1932, none of the 84 summer barleys showed satisfactory resistance to mildew, all the central and north European strains contracting 90 to 100 per cent. infection and only two Japanese selections, Kobai and Nakano Vase, giving any indication of resistance (52·9 and 19·4 per cent., respectively). On the other hand, two of the 44 winter barley varieties tested in 1933, Blätterkinder and *Hordeum hexastichum pyramidum*, remained almost free from attack.

Meimberg (W.). **Ein Beizversuch zur Bekämpfung der Streifenkrankheit der Gerste.** [A disinfection experiment on the control of stripe disease of Barley.]—*Nachricht. über Schädlingsbekämpf.*, ix, 1, pp. 27–29, 1934. [English and French summaries on pp. 58, 60.]

Excellent control of stripe disease of barley [*Helminthosporium gramineum*], combined with a marked stimulatory action, was obtained in 1933 on an East Prussian agricultural station by seed treatment with the recently introduced ceresan liquid preparation U. 564 [*R.A.M.*, xii, p. 84] and ceresan dust, uspulun being somewhat less effective.

Shands (H. L.) & Dickson (J. G.). **Variation in hyphal-tip cultures from conidia of Helminthosporium gramineum.**—*Phytopath.*, xxiv, 5, pp. 559–560, 1934.

Hyphal-tip cultures from the same germinating conidium of *Helminthosporium gramineum* from striped barley leaves reacted differently on potato-dextrose agar, in pathogenicity tests, and in the symptoms produced on barley plants, some being almost non-pathogenic in seed inoculations on the Wisconsin Pedigree 5–1 variety while others caused severe injury. Cultures from some spores showed less range of pathogenicity than others. The nature of the injury varied with the culture used, some inoculated plants developing typical leaf lesions, whereas others infected by cultures from the same spore were dwarfed and rosetted. It is evident, therefore, that a single conidium may carry within its cytoplasmic and nuclear composition factors producing more than one cultural and pathogenic type. Some of the cultures appeared more stable than others, both as regards pathogenicity and type of symptoms produced.

Reed (G. M.). **Inheritance of resistance to loose and covered smut in hybrids of Black Mesdag with Hull-less, Silvermine, and Early Champion Oats.**—*Amer. Journ. of Botany*, xxi, 5, pp. 278–291, 1934.

This is a full report of the results obtained up to date in the author's studies of the inheritance of resistance to loose smut (*Ustilago avenae*) and covered smut (*U. levis*) [*U. kolleri*] in crosses between the highly resistant Black Mesdag oat and the varieties Hull-less, Silvermine, and Early Champion as parents highly susceptible to the Missouri races of both smuts [*R.A.M.*, xii, p. 562]. The three sets of hybrids showed a similar reaction to the two smuts, the results with the F_2 generations indicating that resistance is dominant and that segregation occurs on the basis of a 3 : 1 ratio. The results with the F_3 generations agreed well with the above data, but there were three types of F_3 progenies, depending on whether the F_2 plant had been inoculated with either one of the smuts or was uninoculated. In the first two groups, the F_3 progenies consisted approximately of one resistant to two segregating, while in the third group there were three classes of F_3 progenies, approximating to one resistant, two segregating, and one susceptible. Nearly all of the F_4 progenies were descended from resistant

F_3 families, and practically all of them were pure resistant and many as resistant as Black Mesdag. The marked parallelism in the inheritance of resistance to both smuts in the various F_3 progenies suggests that the same factor or closely linked factors are responsible for the resistance and susceptibility in these hybrids.

O'Brien (D. G.). **Die Streifenkrankheit bei Hafer.** [The stripe disease of Oats.]—*Nachricht. über Schädlingsbekämpf.*, ix, 1, pp. 1–27, 5 figs., 1934. [English and French summaries on pp. 57, 59.]

The writer's studies on the etiology and control of stripe disease of oats (*Helminthosporium avenae*) in Scotland, a detailed semi-popular account of which is given, have already been noticed from other sources [*R.A.M.*, xiii, p. 158].

Leach (J. G.). **The method of survival of bacteria in the puparia of the seed-corn maggot (Hylemyia cilicrura Rond.).**—*Zeitschr. für angew. Entomol.*, xx, 1, pp. 150–161, 9 figs., 1933. [Received July, 1934.]

This is a detailed and fully illustrated account of the author's histological investigation of the pupae in various stages of development of the seed corn maggot (*Hylemyia* [*Phorbia*] *cilicrura*) [*R.A.M.*, xi, p. 259] fed on decaying potato tubers. The bacteria originating from the latter were found to survive in the lumen of the mid-intestine (which is not shed during the moulting process), in the cast-out linings of the fore- and hind-intestine, and in the space between the pre-pupal cuticle and the true pupa. The bacteria surviving in the mid-intestine are reduced in number during the histolytic process inside the puparium, and appear to be subjected to some sort of selective action, so that only short rod-shaped species remain and begin to multiply rapidly before the imago emerges from the puparium.

While no attempt was made to identify the bacteria that survived in the mid-intestine, the fact that such organisms survive through the process of pupation and emerge in a viable condition in the body of the adult insect may be of far-reaching significance from the standpoint of the dissemination of soft rot plant pathogens, in the present case of the potato blackleg organism [*Bacillus phytophthorus*: loc. cit.], and requires further investigation.

Ojerholm (Elizabeth). **Multiciliate zoospores in Physoderma zeae-maydis.**—*Bull. Torrey Bot. Club*, lxi, 1, pp. 13–18, 1934.

The zoospores of the maize pathogen *Physoderma zeae-maydis* have been described as universally uniciliate but during a cytological study the author noted occasional biciliate and triciliate zoospores. The biciliate spores are about twice the size of the uniciliate ones and often contain two nuclei though sometimes only one. Fusion between the uniciliate spores has not been observed but one case of fusion between a uniciliate and a biciliate spore was noted, and there is an obvious possibility that the biciliate forms result from the fusion of sexual gametes. It may, however, be merely a case of incomplete separation of the spores.

The motility of the zoospores apparently lasts for several hours and may be marked by periods of amoeboid movements. The actively swimming forms are generally ellipsoidal and 5 to 7 by 3 to 4 μ in diameter.

Tasugi (H.). **On the life-history, pathogenicity and physiologic forms of Sclerospora graminicola (Sacc.) Schroet. (Studies on Nipponese Peronosporales III.)**—*Journ. Imper. Agric. Exper. Stat.*, Nishigahara, Tokyo, ii, 3, pp. 345–366, 1 graph, 1934. [Japanese, with English summary].

Continuing his studies on *Sclerospora graminicola* on *Setaria italica* and *S. viridis* in Japan [*R.A.M.*, xii, p. 623], the writer successfully inoculated both species with the oospores of the fungus by (*a*) smearing them directly on the seed, and (*b*) mixing them with the soil in which the seed was sown. Under natural conditions the oospores overwinter both on the seed and in the soil. Infection occurred on germinating seedlings transplanted on successive days into soil mixed with oospores up to only seven or eight days old, the percentage infected decreasing with age.

The plants naturally infected in the spring by the overwintered oospores may develop either yellowish-green stripes and abundant conidia on the leaves, or only oospores which form later in the season in the thick, yellowish-white, later brown, shredding foliage, and malformed ears.

Cross-inoculation experiments showed that the strain of *Sclerospora graminicola* from *Setaria italica* could infect an unnamed species (Sarukarazi) of *Setaria* but not *S. viridis*, while that from the latter was confined to its own host. Strains from two unnamed species infected each other but not *S. viridis* and only that from Sarukarazi infected *S. italica*. The conidiophores and conidia of all the strains were closely similar, while the differences between the dimensions of the oospores were also insufficient to justify the establishment of distinct species or even varieties. The oospores on *S. italica* are slightly smaller than those on *S. viridis*, those on one of the undetermined species (Sarukarazi) approximating to the former and those of the other (Karazi) to the latter. Morphologically all the strains may be considered to fall within the specific limits of *Sclerospora graminicola*, but on account of the slight divergences in the oospore dimensions and of the marked differences in pathogenicity it is well to distinguish them as physiologic forms I (*Setaria viridis* strain), II (Karazi strain), III (Sarukarazi strain), and IV (*S. italica* strain).

Yu (T. F.), Chen (H. K.), & Hwang (L.). **Seed treatment experiments for controlling kernel smut of Millet.**—*Nanking Coll. of Agric. & Forestry Bull.* (New Series) 14, 18 pp., 1 fig., 1 graph, 1934.

Millet [*Setaria italica*] kernel smut [*Ustilago crameri*: *R.A.M.*, x, p. 238; xii, p. 617] in China was controlled and yield increased by seed treatments with the following dusts used at the rate of 4 oz. per bushel of seed, copper sulphate, uspulun trockenbeize [ceresan: ibid., vi, p. 278; ix, p. 772], copper carbonate, tillantin

B, and tillantin trockenbeize, as well as by liquid treatment with formalin, uspulun nassbeize, tillantin nassbeize [uspulun-universal: loc. cit.], and tillantin B solution. In general, the dusts (of which uspulun trockenbeize and copper carbonate gave the best results) were less effective than the liquids. Soaking for two hours in formalin was slightly more effective than soaking for one hour. With uspulun nassbeize and tillantin nassbeize soaking for either one or two hours gave practically identical results.

Bitancourt (A.), Da Fonseca (J. P.), & Autuori (M.). **Manual de citricultura. II. Parte. Doenças, pragas e tratamentos.** [Manual of citriculture. Part II. Diseases, pests, and treatments.]—212 pp., 183 figs., São Paulo, Bibliotheca Agric. Popul. Brasil., 'Chacaras e Quintaes', 1933. [Received July, 1934.]

Notes are given in semi-popular terms on the symptoms, etiology, and control of the fungous, bacterial, and non-parasitic diseases and insect pests affecting the Brazilian citrus crop [cf. *R.A.M.*, x, p. 680].

Bitancourt (A.) & Grillo (H. V. S.). **A clorose zonada. Una nova doença dos Citrus.** [Zonate chlorosis. A new disease of Citrus.]—Reprinted from *Arq. Inst. Biol. Defesa Agric. e Animal*, v, 6 pp., 6 pl., 1934. [English abstract.]

Sweet orange (*Citrus sinensis*), lemon (*C. limonia*), and grapefruit (*C. paradisi*) [*C. decumana*] in São Paulo, Rio de Janeiro, and the Distrito Federal, Brazil, are affected by a previously unrecorded zonate chlorosis, the symptoms of which consist in alternating light and dark parallel zones or stripes on the leaves, arranged in elliptical rings or irregular lines symmetrically disposed round the midrib. The green fruits show annular or circular chlorotic areas, and the ripe ones dark brown, slightly depressed, irregular, sometimes ring- or arc-shaped markings. In orchards infested by the rust mite *Phyllocoptes oleivorus* (Ashm.) these dark brown markings generally develop round a previously formed spot which consists of concentric, fine, dark rings and is attributed to the mite. The cause of the disease, which presents some analogies to the concentric ring blotch of South Africa [*R.A.M.*, ix, pp. 450, 523], but differs in some essential features so considerably as to preclude any suggestion of their identity, has not yet been ascertained. Its characters suggest that it may very possibly be due to a virus infection.

Bitancourt (A.). **A podridão do pé das Laranjeras.** [Foot rot of Oranges.]—Pamphlet issued by *Inst. Biol. Defesa Agric. e Animal, Div. Veg. Secç. de Phytopath.*, 12 pp., 5 figs., 1933. [Received July, 1934.]

A popular note is given on the symptoms, determining factors, prevention, and treatment of foot rot of oranges (*Phytophthora citrophthora* and *P. parasitica*) under Brazilian conditions [*R.A.M.*, viii, p. 378; xiii, p. 89].

Sirag-el-din (A.). **Citrus gummosis in Egypt.**—*Min. of Agric., Egypt, Tech. and Sci. Service* (*Mycol. Sect.*) *Bull.* 131, 44 pp., 6 col. pl., 23 figs., 3 graphs, 1934.

An account is given of the symptoms and distribution in Egypt of the citrus gummosis due to *Phytophthora citrophthora* [*R.A.M.*, x, pp. 308, 450, and preceding abstract], as well as of a comprehensive series of experiments in which positive results were obtained by inoculations with *P. citrophthora* of the trunks, roots, and fruits of numerous citrus varieties, the fungus being consistently reisolated from the diseased material. *Fusarium solani* [ibid., xi, p. 39], always associated with citrus gummosis in Egypt, favoured the extension of the disease, but no infection took place when inoculations were made with this organism alone. Observation and experiment showed that mandarin (*Citrus nobilis*) [var. *deliciosa*] and sour orange (*C. aurantium*) [var. *bigaradia*] are the most resistant to gummosis; then grapefruit (*C. maxima*) [*C. decumana* L.], rough lemon (*C. limonia*), and lime (*C. aurantifolia*); and then orange (*C. sinensis*) and sweet lemon (*C. limonia*). The Italian lemon (*C. limonia*) and citron (*C. medica*) are the most susceptible. The paper concludes with brief directions for prevention by improved orchard practices and control by the Californian method [ibid., xi, p. 779; xiii, p. 25].

Fahmy (T.). **Genetic basis of selection procedure with Cotton wilt disease.**—*Min. of Agric., Egypt, Tech. and Sci. Service* (*Mycol. Sect.*) *Bull.* 128, iv + 35 pp., 1934.

In continuation of his genetical studies of the inheritance in cotton crosses of resistance to wilt disease (*Fusarium vasinfectum* var. *aegyptiacum*), the author gives a detailed and tabulated account of his experiments to test the behaviour of the progenies of the phenotypic immune (i.e., behaving 'apparently' as immune in the absence of definite knowledge of their genetical composition), resistant, and susceptible descendants of such crosses [*R.A.M.*, xi, p. 178]. The results showed that the progenies of phenotypic immune plants descended from an immune by susceptible or an immune by heterozygous cross have in the F_3 generation totally immune or segregating families, the members of the former breeding true for immunity. In the F_4 generation, the phenotypically immune plants of segregating families give both totally immune and segregating families, the number of the former being proportionately larger than in the F_3 generation. In the F_2 and F_3 generations of an immune by heterozygous cross the percentage of phenotypic immunes was greater than in the corresponding generations of an immune by susceptible cross. By selection from successive generations of phenotypic immune plants originally derived from the heterozygous strain, Sakha 4, it was possible to increase the percentage of immunity until some of the families produced only totally immune plants in the fifth generation; the immunity of the sixth generation broke down, however, when tested in the greenhouse under conditions of exaggerated infection, but was well maintained under ordinary infected field conditions.

It was further found that the progenies of resistant plants always

segregate, the percentage of phenotypic immunes being, on the whole, larger among the descendants of an immune by heterozygous than of an immune by susceptible cross. The progenies of susceptibles do not in all cases breed true for total susceptibility but usually segregate, giving a very high percentage of susceptible and a very small percentage of resistant and sometimes even of phenotypic immune plants, indicating the persistence in them of an element of resistance.

From the practical standpoint, it is considered possible, by breeding successive generations of phenotypic immune plants descended from an immune by heterozygous cross, in which the heterozygous parent contains a high percentage of immunity, to arrive at the gradual elimination of the susceptible element, and thus to obtain a strain which will behave as totally immune on infected fields for successive generations.

Fahmy (T.). **The selection of wilt immune strains of long staple Cotton (Sakha 4 Gidid).**—*Min. of Agric., Egypt, Tech. and Sci. Service* (*Mycol. Sect.*) *Bull.* 130, vii + 25 pp., 5 pl., 56 diags., 1934.

This is a summarized account of the new method now in use in Egypt for the selection of cotton strains for immunity from the wilt disease [*Fusarium vasinfectum* var. *aegyptiacum*] and for commercial qualities of the lint, the first part of the work being based on the principles explained in a previous publication [see preceding abstract]. This is followed by the history of the selection of one of the five cotton strains which were retained at the end of the work, namely, Myco 19 (isolated from Sakha 4), which is completely immune from wilt under the worst conditions of field infection at Gemaiza, and which is now being propagated under the name Sakha 4 Gidid. This strain is stated to have a better yielding capacity than Sakha 4 and is equal to the latter in lint quality.

Miles (L. E.). **Verticillium wilt of Cotton in Greece.**—*Phytopath.*, xxiv, 5, pp. 558–559, 1934.

Information has been received from J. A. Sarejanni that the cotton wilt caused by *Verticillium albo-atrum*, previously recorded in the United States [*R.A.M.*, xii, p. 92], was observed in 1932 in Greece on crops grown from American seed and has since spread throughout the country. No evidence of the occurrence of the fungus within the cotton seed has been obtained but it is inferred, though actual proof is lacking, that the disease was introduced with seed from the United States. Cultures of the Greek *Verticillium* received at Mississippi proved to be identical with American isolations.

King (C. J.), Hope (C.), & Eaton (E. D.). **Further observations on the natural distribution of the Cotton root-rot fungus.**—*Phytopath.*, xxiv, 5, pp. 551–553, 1 fig., 1934.

Cotton root-rot (*Phymatotrichum omnivorum*) [*R.A.M.*, xiii, pp. 92, 231] has recently been recognized in southern Utah, which may provisionally be considered the northern limit of the fungus,

while southward the disease extends into Sonora [Mexico] and Lower California. In 1933 the fungus was found on dying and dead Mexican poppy (*Argemone* sp.) plants a short distance south of the United States—Mexican boundary in a mountain wash draining through the Jacumba (California) settlement, where some lucerne fields were observed to be infested about a year earlier [ibid., xii, p. 516]. Under desert conditions the detection of the root-rot fungus is very difficult, being dependent on the casual discovery of a dead plant or of the rise of spore mats to the surface in wet weather. Early infestations in the Gila Valley are often traceable to diseased mesquite [*Prosopis juliflora*] roots or stumps or to the shrub *Lycium*. In addition to the native species already listed as root-rot carriers [ibid., xi, p. 370], the following were observed to bear the mycelium of the fungus in 1933: *Franseria confertiflora*, *Gutierrezia lucida*, *Platanus wrightii*, *Parkinsonia aculeata*, *Aster spinosus*, and *Cercidium torreyanum* [*P. torreyana*]. Evidence is adduced in support of the view that the movement of water in erosion and drainage from the higher elevations may play an important part in the infestation of the cultivated areas of the lowlands and deltas [loc. cit.].

Ezekiel (W. N.), Taubenhaus (J. J.), & Fudge (J. F.). **Nutritional requirements of the root-rot fungus, Phymatotrichum omnivorum.**—*Plant Physiol.*, ix, 2, pp. 187–216, 3 figs., 3 graphs, 1934.

This is a full account of the authors' studies of the nutritional requirements of *Phymatotrichum omnivorum* [a preliminary report of which has already been noticed: *R.A.M.*, x, p. 380]. In pure culture the fungus utilized the phosphate, magnesium, potassium, and probably also the sulphate mineral ions. Nitrogen was utilized equally well from organic sources (e.g., amino acids, peptone, and urea), inorganic ammonium, and nitrate salts. Ammonium nitrate was frequently the best source of nitrogen, a fact which is apparently in contradiction with the results obtained by Neal, Webster, and Gunn [ibid., xiii, p. 92], who, however, used ammonium nitrate and other nitrogen sources at concentrations found in these experiments to be too high for optimum growth. As sources of carbon the fungus utilized pentose and hexose monosaccharide sugars, disaccharide sugars, starch, and to a lesser degree mannitol. The best growth was produced in alkaline solutions; good development still occurred at P_H 3·7, but growth was inhibited at approximately P_H 3. There was no evidence that the fungus produced staling substances in the substrata after 33 days' growth.

The addition of small quantities of carrot juice to synthetic media resulted in a disproportionately large increase in growth of the fungus, but both of the vitamins A (from cod-liver oil) and B (from rice bran extract), at the concentrations used, were shown to be of little nutritive value to *P. omnivorum*. Sclerotia developed most abundantly in media best suited to rapid and abundant vegetative growth.

The variety of nutrient conditions found to be suitable for *P. omnivorum* agrees well with its wide host range, and also with

the fact previously established that the immunity of monocotyledonous plants is apparently determined by the presence in them of substances toxic to the fungus, rather than by any lack of nutrients.

Neal (D. C.) & Wester (R. E.). **An undescribed Sclerotium fungus prevalent in north-east Texas.**—*Phytopath.*, xxiv, 5, pp. 528–533, 4 figs., 1934.

Latin and English diagnoses are given of *Ozonium texanum* n. sp., found in 1932 on decayed cotton roots, stalks, and leaves just below soil level at Greenville, Texas. The fungus is characterized by a septate, sterile mycelium, at first white, later pale yellow or buff, and hyphae with opposite or alternate branches arising below the septa and growing in opposite directions or at an angle of 45° to the axis, with individual cells averaging 60 by 5·5 μ in diameter, forming plectenchymatic strands which enlarge into white to pale yellow sclerotia, 1 to 5 mm. long, of variable shape, usually ellipsoid or radiciform, constricted, often forked at the strand connexions, occasionally round or ovoid. The species differs from *Phymatotrichum omnivorum* in the finer texture of the strands, rapid formation of sclerotia on agar, apparent saprophytism, ease of culture, and in the absence of acicular hyphae and right angle branches.

Petch (T.). **Entomogenous fungi from Madagascar.**—*Ann. de Cryptog. Exot.*, vi, 3–4, pp. 230–235, 1933. [Received July, 1934.]

The author gives a list, with annotations, of 15 species of entomogenous fungi collected in Madagascar by R. Decary. Three new species are described, with Latin diagnoses, namely, *Cordyceps cinnabarina* on a lepidopterous larva, *Clonostachys compacta* on a beetle, and *Spicaria* (*Isaria*) *rectangularis* on a lepidopterous pupa. *C. compacta* is characterized by hyaline, continuous, oblong or oblong-oval conidia measuring 5 to 6 by 2·5 to 3 μ, which adhere to one another obliquely, forming a vertical row in line with a phialide, while the rows from adjacent phialides cohere in regular columns up to 0·2 mm. high and 10 μ in diameter, resembling an ear of wheat. There is no central rachis and except for the arrangement of the conidia the fungus is a *Spicaria*. *Coremium pulcherrimum* is renamed *Spicaria* (*Isaria*) *pulchella* Petch, nom. nov.

Boczkowska (Marie). **Quelques observations sur l'Isaria sp. parasite de Panolis flammea Schiff. en Pologne. (Note préliminaire.)** [Some observations on the species of *Isaria* parasitic on *Panolis flammea* Schiff. in Poland. (Preliminary note.)]—*Rev. Path. Vég. et Ent. Agric.*, xxi, 1, pp. 67–74, 1934.

In this preliminary note the author records controlled experiments with a species of *Isaria* which was found parasitizing larvae and pupae of the Noctuid moth *Panolis flammea* [*R.A.M.*, vii, p. 321] in pine forests of Pomerania. In pure culture the fungus grew well at temperatures of 12·5° to 21° C., while lower temperatures down to 0° inhibited its growth but did not kill it. Light

did not appear to have any effect on the development and fructification of the organism, which grew equally well on and in forest soil containing from 25 to 100 per cent. of its water-holding capacity. Artificial infection experiments on pupae did not give conclusive results, as instars began the hatch out of the pupae on the second day following inoculation, but it was noted that a few of the hatched moths died inside the infection chamber, possibly from attack by the fungus, and were covered with coremia.

The spores and sclerotia of the fungus were found to remain viable in pure culture for at least six months, and when incubated, one-year-old mummies produced conidia; the same was also true of 15-month-old and desiccated cultures of the fungus on potato slants and on soil.

Ciferri (R.) & Redaelli (P.). **Phénomènes de conjugaison et d'endosporulation 'in vitro' du Coccidioides immitis Stiles.** [Phenomena of conjugation and endospore formation *in vitro* of *Coccidioides immitis* Stiles.]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, vi, 5, pp. 141–145, 1934.

In cultures of *Coccidioides immitis* [*R.A.M.*, xiii, p. 579] reisolated from a granulomatous subcutaneous lesion in an inoculated guinea-pig, cell conjugation was observed for the first time, the endospore of two cells in close proximity swelling and buds being produced which united by means of a short conjugation bridge. The whole protoplasmic content passed from one gamete to the other, that of the smaller (when they were of different sizes) being absorbed by the larger. The resultant zygote appeared to have no visible character distinguishing it from the gametes.

The cells of *C. immitis* containing endospores are regarded as sporangia, and it is suggested that the zygote becomes transformed into a sporangium with aplanetic zoospores.

The authors' observations are considered to support their view that *C. immitis* should be placed among the Chytridiales in the family Coccidioidaceae Moore (1931) emend. Ciferri (1932).

Shrewsbury (J. F. D.). **The genus Monilia.**—*Journ. of Path. & Bact.*, xxxviii, 3, pp. 313–354, 9 pl., 1934.

A comprehensive, tabulated account is given of the author's studies, extending over a three-year period at the University of Birmingham, on 19 strains of fungi commonly placed in the *Monilia* group, with regard to which great confusion exists owing to the different systematic criteria employed by botanical and medical mycologists. Four of these strains belong to the genus *Monilia* as understood by Persoon and were isolated by C. G. C. Chesters from brown rot of apple, pear, plum, and gooseberry, respectively, while the remainder are comprised either in the genus *Monilia* as understood by Castellani (not Persoon) or in allied genera of anascosporous, yeast-like fungi. These 15 strains do not form a homogeneous group. *M.* [*Candida*] *krusei* [*R.A.M.*, xiii, p. 511] is morphologically distinct from all the others and should not be included in Castellani's genus *Monilia*, approximating rather, in the writer's opinion, to a mycodermal yeast (near *Mycoderma cerevisiae*). The other 14 fall into four ill-defined groups,

viz., (1) *M. candida* [*C. vulgaris*] and *M. tropicalis*, (2) *M.* [*C.*] *albicans*, *M.* [*C.*] *psilosis*, *M.* [*C.*] *pinoyi*, P. J. Marett's fungus from pulmonary tuberculosis [ibid., xii, p. 692], an organism isolated by Mackey from a carcinoma of the lung, and five fungi obtained by the writer from human bronchi and other sites. All the fungi in this group are considered to be variants of the common *C. albicans*. (3) A fungus, believed to be an anascosporous yeast, isolated by the writer from a tuberculous sputum; and (4) two organisms, equally regarded as anascosporous yeasts, isolated by the writer, one from a tuberculous sputum and the other from a case of septic rhinitis. Omitting *M. krusei*, the only differentiation of the species of *Monilia* described by Castellani which the writer has found to be reliable, using the fermentation of sugars as a basis, is the separation of the first from the second of these groups by testing with sucrose, which *M. candida* and *M. tropicalis* ferment while the rest do not.

In the course of a discussion, based on exhaustive morphological, cultural, and biochemical researches on the groups under observation, the writer summarizes and criticizes the views set forth by Miss Berkhout [ibid., iii, p. 555], Henrici [ibid., x, p. 257], and Jacobson [ibid., xii, p. 217] regarding the generic limits of *Monilia* and some related genera.

MOORE (M.). **A new Geotrichum from a bronchial and pulmonary infection, Geotrichum versiforme Moore, n.sp.**—*Ann. Missouri Bot. Gard.*, xxi, 2, pp. 349–364, 1 pl., 1934.

From a case of bronchiectasis and pulmonary infiltration a *Geotrichum* was isolated which in hanging drop culture developed by the germination of an arthrospore into single or branched hyphae which at maturity formed thick-walled segments, breaking up into arthrospores by disarticulation. These at first are more or less rectangular but they become spheroidal, ovoid, or ellipsoid after separation, and measure 6 to 18 by 4 to 9 μ. Large terminal or intercalary chlamydospores are also formed, and measure up to 18 μ when spherical and 20 to 30 by 6 to 8 μ when elongated. Occasional small spherical cells (possibly blastospores), 4 to 6 μ in diameter, are formed laterally, and pyriform, conidium-like cells, 4 to 6 by 3 to 4 μ were also noted. The cultural, nutritional, and fermentative characters of the organism are described in detail. It is named *G. versiforme*, n. sp., with diagnoses in Latin and English, and there is a bibliography of 14 titles.

WILLIAMS (J. W.). **Scalp products and hair before puberty as culture medium for certain pathogenic fungi.**—*Proc. Soc. Exper. Biol. & Med.*, xxxi, 8, pp. 944–945, 1934.

Hair and scalp products of children under twelve, after or without extraction for 24 hours with ether, were placed in test tubes, moistened with distilled water, autoclaved, and used as a medium for a number of pathogenic fungi, parallel cultures of which on Sabouraud's agar were also made [cf. *R.A.M.*, xiii, p. 512]. With the exception of *Endomyces capsulatus* [ibid., xiii, p. 95], all the organisms grew on ether-extracted hair, while *Achorion schoenleini* was the only one that failed to develop on

untreated hair. The most profuse growth on extracted hair was made by *Glenospora gammeli, Indiella americana, Microsporon apiospermum, M. audouini, Monilia* [*Candida*] *albicans*, and *Trichophyton interdigitale* [*T. mentagrophytes*].

MOORE (M.). **Posadasia pyriformis and P. capsulata, two causative organisms of Darling's histoplasmosis in the United States.**—*Ann. Missouri Bot. Gard.*, xxi, 2, pp. 347–348, 1934.

Diagnoses are given in English and Latin of two fungal organisms, *Posadasia pyriformis* n. sp., and *P. capsulata* (Darling) Moore, n. comb. (syn. *Histoplasma capsulatum* Darling) associated with the human disease known as Darling's histoplasmosis, characterized by an acute specific infection usually affecting the epithelial and endothelial cells of the lungs, liver, and spleen. The organisms may also be present in a free state in these organs, as well as in the blood stream, reproduction in the host being by single yeast-like cells. In culture a mycelium, conidia, chlamydospores, and multispored asci are formed. Complete morphological, cultural, biochemical, and cytological details will be given in a subsequent paper.

SNYDER (A. J.). **Cause of yellow spots on canvas painted with chrome greens.**—*Indus. & Engin. Chem.*, xxvi, 5, pp. 579–580, 1934.

The author describes experiments showing that the yellow spotting often found on the chrome green painted stripes and other patterns on the cotton duck used for awnings and garden furniture in the United States is due, not to the moulds present in some of the samples [cf. *R.A.M.*, xi, p. 240], but to amine- or ammonia-forming bacteria which probably originate in the spinning and weaving rooms. The total nitrogen content of the canvas samples submitted by different manufacturers ranged from 0·16 to 0·23 per cent., and it is suggested that the spotting may be controlled either by eliminating this source of nutrition or adding an antiseptic to the cloth.

BEWLEY (W. F.) & ORCHARD (O. B.). **Rose diseases.**—*Nineteenth Ann. Rept. Cheshunt Exper. & Res. Stat., Hertfordshire, 1933*, pp. 45–47, 1934.

When a large number of diseased roses grown in glasshouses and the open in various parts of England were examined the commonest leaf disease was powdery mildew (*Sphaerotheca pannosa*) [*R.A.M.*, xii, pp. 642, 733] and the next commonest was rust (*Phragmidium subcorticium*) [*P. mucronatum*: ibid., xii, p. 175]. Where death was due to stem and root infection *Coniothyrium rosarum* [ibid., ix, p. 722] predominated and this fungus caused a striking amount of damage, though *C. fuckelii* [*Leptosphaeria coniothyrium*: ibid., xii, p. 633] and *Diaporthe umbrina* [ibid., xii, pp. 291, 696] also occurred. Considerable injury, especially to standard roses, was caused by *Botrytis* sp.

Of numerous fungicidal spray compounds tested in the dormant season none reduced or delayed the development of mildew and they probably had no effect on rust. The best results with

summer sprays against rust were obtained when certain copper compounds were carried in an emulsified oil.

Williams (P. H.). **Leafy gall of the Chrysanthemum.**—*Nineteenth Ann. Rept. Cheshunt Exper. & Res. Stat., Hertfordshire, 1933*, pp. 39–44, 1934.

In December, 1933, J. W. Streeter, Thanksgiving Pink, Crimson Conquest, December Bronze, and Cheshunt White chrysanthemums at Cheshunt Experiment Station showed, respectively, 57·9, 33·3, 30·2, 1·9, and 1·6 per cent. leafy gall, from which the organism resembling *Bacterium tumefaciens* was again isolated [*R.A.M.*, xii, p. 698]. There was some evidence that the addition of calcium sulphate to the soil reduced the disease, but the most promising method of control lies in the use of clean stock for propagating.

Young (P. A.). **Stem canker of Hollyhock caused by Sclerotinia sclerotiorum.**—*Phytopath.*, xxiv, 5, pp. 538–543, 2 figs., 1934.

From 1931 to 1933 the writer investigated the stem canker of hollyhocks (*Althaea rosea*) in Montana caused by *Sclerotinia sclerotiorum*. Diseased plants develop white or light brown cankers, 5 to 45 cm. long and girdling the stem, which often bear sclerotia, white pustules, and brown arc-lines; retted bast fibres project from the lesions and sclerotia are found in the stems hollowed out by the fungus. Inoculation experiments with the fungus isolated from the hollyhock produced the typical symptoms on that host, while on White Beauty sunflowers (*Helianthus annuus*) it caused a characteristic and destructive wilt, destroying the plants within 60 days [*R.A.M.*, viii, p. 246 *et passim*]. *S. sclerotiorum* was re-isolated from the infected hollyhock and sunflower stems. Apothecia and filiform bodies (representing an immature stage of the apothecium) were formed both in nature and in agar cultures. The morphological characters of the fungus are briefly described.

Burnett (G.). **Stunt—a virosis of Delphinium.**—*Phytopath.*, xxiv, 5, pp. 467–481, 8 figs., 1934.

The symptoms of the virus disease known as 'stunt' or 'witches' broom' of delphiniums, which is common in Washington, Idaho, and other parts of the United States, have already been described [*R.A.M.*, vi, p. 18; xii, pp. 449, 473]. By mechanical means the virus has been transmitted to tobacco, tomato, cucumber, *Nicandra physaloides*, *Solanum nigrum*, prickly lettuce (*Lactuca scariola*), *Zinnia* sp., *Marrubium vulgare*, *Anthemis cotula*, *Capsella bursa-pastoris*, and *Petunia hybridum*, causing noticeable reactions of various types in all except the last three, which apparently carried the infective principle in a latent form, as determined by reinoculations into tobacco. Combined with tobacco mosaic, the delphinium virus intensifies the symptom expression of the tobacco mosaic on tobacco and causes on tomato variable manifestations, including filiform leaves and a type of streak [ibid., xiii, p. 192]; tomatoes inoculated with the delphinium virus and the potato latent virus developed spot necrosis and other symptoms not associated with either infective principle alone.

ROEDER (W. v.). **Wachstumsstörungen bei Kakteensämlingen.** [Growth disturbances among Cactus seedlings.]—*Kakteenkunde, 1934*, 5, pp. 88–90, 1 fig., 1934.

Attention is drawn to the occurrence among *Echinocactus myriostigma* seedlings in Germany of a growth failure due to the attack of an undetermined 'root-strangling' fungus which is prevalent in dense, ill-aerated plantings, in encrusted soils, and under other unfavourable conditions. Fungicides having proved useless against the trouble, the writer successfully treated the affected plants with a 1 in 1,000 solution of hakaphos, a stimulatory preparation containing 28 per cent. nitrogen. Some cultural directions are given for the elimination of the factors inducing poverty of growth and consequent fungal infection.

MCLAUGHLIN (ALICE M.). **A Fusarium disease of Cereus schottii.**—*Phytopath.*, xxiv, 5, pp. 495–506, 3 figs., 1934.

From a diseased cactus, *Cereus schottii*, in Mexico and Arizona the writer isolated a *Fusarium* closely allied to *F. oxysporum*, but differing from the latter in its smaller macroconidia, higher percentage of 4- and 5-septate spores, the absence or poor development of the spore foot, and in pathogenicity. The fungus is therefore tentatively classified as a variety of *F. oxysporum*. On inoculation with it *C. schottii* plants developed the typical vascular discoloration occurring in naturally infected individuals and from such experimental plants the fungus was reisolated. It appears to secrete a toxic substance affecting the living cells of the host beyond the actual range of the hyphae.

ERWIN (L. E.). **A grass destroying fungus new to America.**—*Forty-sixth Ann. Rept. Rhode Island State Coll. Agric. Exper. Stat.* (*Contrib.* 449), pp. 89–92, 1934.

In this paper (reprinted from *Bull. Rhode Island State Coll.*, xxix, 4, 1934) attention is drawn to the occurrence of *Corticium fuciforme* [*R.A.M.*, xi, p. 246, where it is spelt '*fusiforme*' in error] on Massachusetts and Rhode Island golf courses and polo grounds in 1932 and 1933. The fungus forms on bluegrass [*Poa pratensis*] and most species of bent [*Agrostis*] bright coral-pink, branched tufts, up to $\frac{1}{4}$ in. high, and furnished with an effused, mucous base. This appears to be the first record of the fungus [the taxonomic position of which is briefly summarized] in North America.

STREETS (R. B.). **The treatment of deciduous fruit trees and nut trees infected by Phymatotrichum omnivorum with ammonium compounds.**—*Science*, N.S., lxxix, 2053, pp. 417–418, 1934.

A preliminary note is given on the very promising result of experiments conducted in the Yuma Valley, Arizona, against root rot (*Phymatotrichum omnivorvm*) of deciduous fruit trees, nuts, and ornamentals by fairly heavy applications of dilute solutions of ammonium sulphate or ammonium hydrate [*R.A.M.*, xi, p. 370]. Pecans [*Carya pecan*] responded particularly well to the treatment,

which cured all the trees in one of two trial orchards and effected a considerable improvement among those of the other.

MARSH (R. W.). **A summary of recent investigations on Apple scab.**—*Ann. Rept. Agric. & Hort. Res. Stat. Long Ashton, Bristol, for 1933*, pp. 88–95, [1934].

In this paper, written in non-technical language and based on the more important recent papers on the subject, the author gives an account of various aspects of apple scab [*Venturia inaequalis*], the points dealt with including infections on the shoots, spread of infection in spring, times for spraying, spray damage, choice of fungicide, and suggested spraying programme for a group of six common commercial varieties of apple. A bibliography of 18 titles is appended.

BAINES (R. C.). **Control of Apple sooty blotch by May and June sprays.**—*Phytopath.*, xxiv, 5, pp. 553–555, 1934.

In sooty blotch [*Gloeodes pomigena*] control tests in 1928 one plot of Jonathan, Stayman, Grimes, and Rome Beauty apple trees at Lafayette, Indiana, was sprayed five times with liquid lime-sulphur and lead arsenate and lime (last two) and a similar plot given twelve treatments with colloidal sulphur-lead arsenate dust (85–15), the final spray being applied on 9th June and the last dust on 11th. The percentages of clean fruit on the sprayed and dusted plots were 87·3 and 67·3, respectively, while only 8·5 and 2·7 per cent., respectively, of the fruit on the untreated Jonathan and Rome Beauty trees was unaffected. In 1932, 99·5 per cent. of the fruit on a Rome Beauty tree sprayed four times with Bordeaux mixture was clean, the corresponding figures for two Staymans treated with flotation sulphur [*R.A.M.*, xiii, p. 310] and three of the same variety sprayed with ansul sulphur being 97·9 and 94·1, respectively; the Rome Beauty and Jonathan trees receiving only two early applications of 1 in 50 lime-sulphur yielded, respectively, 37·5 and 57 per cent. clean apples. From these data it is apparent that effective control of sooty blotch is given by fungicidal treatment just before the limited period of spore dissemination, which occurred in 1932 between the end of May and middle of June [ibid., xii, p. 298].

WALLACE (T.). **Some physiological disorders of fruit trees.**—*Ann. of Appl. Biol.*, xxi, 2, pp. 322–333, 1934.

This is a briefly summarized review of the work done hitherto in the investigation of physiological troubles of fruit trees in various parts of the world, the results of which have shown that the most common causes of such disorders are deficiencies or excesses of nutrient elements, including unsuitable ratios of certain of these; unfavourable reaction of the soil; toxic concentrations of salts in the soil; unfavourable water relations in the soil; and unfavourable climatic factors. Each of these causes is concisely discussed, with an indication of the symptoms produced by it and of the measures used for its control. The paper terminates with a bibliography of 78 titles.

Roach (W. A.). **Injection for the diagnosis and cure of physiological disorders of fruit trees.**—*Ann. of Appl. Biol.*, xxi, 2, pp. 333–343, 8 diags., 1934.

In the introductory section to this paper the author briefly refers to the difficulty of application to large fruit trees of the water and sand culture methods for the investigation of physiological disorders due to deficiencies of nutrient elements, and also to the fact that the interpretation of the results of manurial experiments for the same purpose is complicated by base exchange and similar phenomena. For these reasons he suggests, as an additional method of study, the direct injection of suitable substances into the trees [cf. *R.A.M.*, ix, p. 501 ; xii, pp. 339, 602, *et passim*], which should merely supplement the normal supply from the soil and should not upset the dynamic equilibrium existing between the elements in the soil solution. He then describes methods for injecting whole trees, separate branches with or without their corresponding roots, or separate twigs. In terminating, he mentions some effects obtained by him from injections on the vigour of the tree and on disease.

Chaudhuri (H.) & Johar (D. S.). **On Schizophyllum commune Fr., a parasite on trees in Lahore.**—*Journ. Indian Bot. Soc.*, xiii, 1, pp. 67–69, 1 pl., 1934.

Positive results are stated to have been obtained from inoculations made through wounds with pieces of the sporophore or with pure cultures of *Schizophyllum commune* [*R.A.M.*, xiii, p. 186] isolated from dead mango trees at Lahore, on *Dalbergia sissoo*, apple, *Acacia arabica*, apricot, mango, mulberry, and orange. Some six weeks after inoculation the affected tissues developed a brown discoloration, accompanied in the case of *A. arabica* by gum exudation ; numerous hyphae of the fungus were present in the wood.

Wilson (E. E.). **A bacterial canker of Pear trees new to California.**—*Phytopath.*, xxiv, 5, pp. 534–537, 1 fig., 1934.

Wilder, Easter Beurre, Winter Nelis, and Beurre Hardy pears and an unknown apple variety are liable in California to a bacterial canker contrasting in various respects with that due to *Bacillus amylovorus*. The periderm of the affected branches becomes loosened and raised, portions of it sloughing away to expose the spongy, disorganized, underlying cortex, which is light tan or buff in the case of active cankers, with brownish streaks extending upwards and downwards through the cortex and outer phloem for a distance of several inches beyond the visible lesion. During the summer the outer bark becomes longitudinally and transversely cracked as a result of the regenerative process below, while simultaneously the streaks at the apical margins of the cankers turn dark brown or almost black. The cankers are confined to the outer cortex and phloem, so that as a rule a long period is required for the disease to kill the trees ; in 1933, however, a number were destroyed in Placer County.

Unlike fireblight, the type of bacterial canker here described is active during the cooler months ; the cambium is not involved and

the loose, brownish cankers are quite distinct from the dark grey to black ones formed by *B. amylovorus*, in which, moreover, the periderm usually adheres firmly to the reddish-brown bark.

Isolations from the diseased tissues consistently yielded a bacterium capable of reproducing the symptoms of the disease on pear branches. It has not yet been thoroughly investigated, but has already been found to differ from *B. amylovorus* in cultural characters. A greenish pigment is formed on many media, suggesting a relationship with *Pseudomonas cerasi* [see next abstract] which was also indicated by the results of inoculation tests.

Wilson (E. E.). **Variability of Pseudomonas cerasi in physical characteristics of growth on solid media.**—*Phytopath.*, xxiv, 5, pp. 548–550, 1 fig., 1934.

Not only does *Pseudomonas cerasi*, the agent of a stone fruit canker in California [*R.A.M.*, xii, p. 455; xiii, p. 451, and preceding abstract], vary in pigment production in culture, but changes sometimes occur in the physical characteristics—elevation, topography, and consistency—of the colony. Thus, variants of the common flat, smooth, butyrous type have been isolated from the cankers in the form of raised, convolute, gelatinous colonies, the typical growth of which persisted on transference to potato dextrose agar slants for several months but eventually reverted to the normal. The gradual transformation of a flat, butyrous colony into a raised, gelatinous one was actually observed, and in plating-out tests the latter produced only gelatinous colonies whereas the normal flat areas gave rise to both types. A single-cell culture of *P. cerasi* changed from the butyrous to the gelatinous type and the variant was shown by inoculation experiments to be moderately pathogenic. The characters of the variant are considered to indicate a possible relationship between *P. cerasi* and *P. spongiosa* [*Bacillus spongiosus*: ibid., vii, p. 177].

Ogilvie (L.), Swarbrick (T.), & Thompson (C. R.). **A note on a Strawberry disease resembling the American 'crinkle'.**—*Ann. Rept. Agric. & Hort. Res. Stat. Long Ashton, Bristol, for 1933*, pp. 96–97, 3 pl. [1934].

A strawberry disease with symptoms identical with those of crinkle, as described by Zeller, in the United States [*R.A.M.*, xiii, p. 313], and differing from yellow edge [ibid., xii, p. 519] in the spotting and distortion of the leaves, has been observed by the authors in commercial strawberry plantations in south-western England for over five years. *Myzus fragaefolii*, the insect vector of crinkle in the United States, is stated to be thought to be identical with the common English aphis *Capitophorus fragariae*. Further investigations are in progress.

Simmonds (J. H.). **Bunchy top of the Banana and its control.**—*Queensland Agric. Journ.*, xli, 3, pp. 241–244, 3 figs., 1934.

After briefly describing the symptoms of bunchy top of bananas in Queensland [*R.A.M.*, xiii, p. 111] and discussing the nature and spread of the disease, the author states that control measures consist in the planting of disease-free suckers and the eradication of

diseased plants as soon as the symptoms appear. The Banana Industry Protection Board [ibid., ix, p. 607] is able to advise where planting material may be obtained. For the eradication of diseased plants the author recommends pouring at least half a pint of pure kerosene into the central leaf and allowing it to trickle down round the leaf bases so that the aphid vectors [*Pentalonia nigronervosa*] present may be killed; after a few hours the plants should be dug up and chopped into pieces. The plants associated with the affected one in the stool should be similarly kerosened and removed.

MAGEE (C. J.). **Squirter disease of Bananas.**—*Agric. Gaz. New South Wales*, xlv, 5, pp. 262–264, 1 fig., 1934.

A brief, popular account, based partly on the work of Simmonds and McLennan [*R.A.M.*, xiii, pp. 42, 43], is given of squirter disease (*Nigrospora sphaerica*) of bananas in Queensland, the chief points dealt with being its economic importance, symptoms, causal organism, seasonal nature, and control by improved packing and storing methods.

KESSELER (E. v.). **A preliminary study of varietal resistance in the Pineapple to the root rot fungus Nematosporangium rhizophthoron.**—*Amer. Journ. of Botany*, xxi, 5, pp. 251–260, 1934.

The work briefly described in this paper was carried out in 1932 at the Experiment Station of Honolulu, Hawaii, for the purpose of obtaining some preliminary information on the relative resistance of pineapple varieties and hybrids (thirteen of which were tested) to the root rot caused by *Nematosporangium* [or *Pythium*] *rhizophthoron* [*R.A.M.*, x, pp. 342, 740; xi, p. 129], and of developing a suitable technique for varietal tests. The degree of susceptibility of the hosts was measured by three different methods, namely: the rate of progress of rotting in very young root tips put into direct contact with pure cultures of the fungus in soil in observation boxes, during 48 hours after inoculation; the percentage of roots rotted in inoculated water cultures of single plants during a period of 21 to 31 days; and the retardation of host growth in artificially infected soil during a period of up to six months. While it is recognized that the first method takes into account only part of the possible factors in resistance, it proved to be sufficiently rapid and precise to give results of statistical significance, and was therefore used more extensively than the other two.

The results seemed to indicate the existence of definite differences in the susceptibility of the different varieties of pineapple to *N. rhizophthoron*, among which Cayenne proved most susceptible in the root inoculation but was somewhat variable in the water culture tests, while Wild Kailuga was second and third in order of susceptibility in these two series of tests, respectively. Pernambuco, Congo, and Ruby were fairly resistant in both series. The hybrid lot 520 was very high in resistance in the single root test, and Wild Brazil showed evidence of being even more resistant in the small number of tests made with it. In three hybrid varieties,

the parents of which were also tested, susceptibility was intermediate between that of the parent forms in the single root inoculation tests.

The results of the experiments made by the third method indicated that the soil type is of considerable importance for the pathogenic activity of *N. rhizophthoron*. In sterilized soil originating from a high rainfall region, where in the field it often shows considerable damage by Pythiaceous fungi, the Cayenne variety growing in artificially inoculated containers suffered a statistically significant retardation of growth as compared with the controls, while in similar tests of this variety in sterilized soil from a low rainfall region, where there is seldom much damage in the field, no appreciable differences were seen between the inoculated and control plants. Lot 520 and Pernambuco did not show any differences in weight increase during the period of the test in either type of soil, apparently because of the resistance of these two varieties to the disease.

Horsfall (J. G.), Newhall (A. G.), & Guterman (C. E. F.). **Dusting miscellaneous seeds with red copper oxide to combat damping-off.**—*New York (Geneva) Agric. Exper. Stat. Bull.* 643, 39 pp., 4 figs., 3 graphs, 1934.

This is a summarized account of the results [given in two separate tables] obtained in continued greenhouse and field experiments on the efficacy of red [cuprous] oxide of copper [*R.A.M.*, xii, p. 232; xiii, pp. 5, 388] in the control of damping-off caused mainly by *Pythium ultimum*, and to a lesser degree by *Rhizoctonia* [*Corticium*] *solani*, of 107 species and varieties of ornamental and vegetable seedlings. Fifty-four of these (including beet, cabbage, carrot, cauliflower, cucumber, lettuce, melon, pea, spinach, and tomato) gave favourable results, but some cruciferous and leguminous plants showed a tendency to injury, and should be treated with caution. Onions, leeks, chives, and maize responded poorly or were injured. Injury to the plants appeared to be more likely to occur in the absence of organic matter or of sufficient moisture in the soil, and pre-soaking of certain seeds before dusting also appeared to favour injury. In small doses, the dust sometimes accelerated emergence and the elongation of the seedlings, and deepened the green colour of cucurbits, peas, tomatoes, and several others.

While most of the tests were made in soil naturally infected with *P. ultimum*, similar experiments in soil artificially infected with *C. solani* showed that this fungus may also be controlled by red oxide of copper, possibly on account of the cuprous ion.

The dose to be applied largely depends on the size and shape of the seed, varying from 0·25 to 0·50 per cent. by weight for cucurbits, peas, &c., to about 2·5 per cent. (1 level teaspoonful per pound) for the majority of the seeds, and 6 per cent. for beets. The seed should be shaken dry with the dust in a tight container until each seed is completely coated; they may then be held for any reasonable length of time in dry storage without injury. The dust should be bright, brick-red in colour, not darkening on standing, strongly adherent to white paper, and capable of passing through

a 325-mesh screen, leaving not more than 2·5 per cent. by weight of coarse particles.

Branas (J.) & Dulac (J.). **Nouvelle contribution à l'étude du mode d'action des bouillies cupriques.** [A new contribution to the study of the mode of action of copper mixtures.]—*Comptes rendus Acad. d'Agric. de France*, xx, 14, pp. 500–505, 1934.

Continuing their investigations of the factors governing the efficacy of copper compounds in the control of *Plasmopara viticola* [*R.A.M.*, xiii, p. 423], the writers conducted the following experiment. On a leaf of a vine were deposited a drop of water, particles of green malachite ($CuCO_3.CuO.H_2O$), and conidia of *P. viticola*, the whole being covered by a bell-jar. At the end of two hours, living zoospores were found to be present and a week later it was clear that infection had taken place. Similar results followed the substitution for green malachite of copper oxide or blue malachite ($CuCO_3.CuO.2H_2O$). On the other hand, no infection took place in the presence of blue malachite paste and the still more soluble tetracupric sulphate ($CuSO_4.3CuO.4H_2O$), or in that of 1 in 500,000 copper sulphate. Further proof is thus afforded of the importance of solubility in determining the efficacy of copper mixtures against vine mildew. The quantity of washed precipitate necessary for the protection of the foliage varies with the hydrogen-ion concentration of the rain water, diminishing in proportion to the fall of the latter—a natural consequence of the solvent action of acidity. In 1933 the high acidity of the autumn rains in France explains the observations of L. Ravaz as to the efficacy at this period of treatments applied several months previously. No support is stated to be forthcoming for the view that contact is necessary for the fungicidal action of the spray deposit. [This paper is reprinted in *Prog. Agric. et Vitic.*, ci, 21, pp. 494–496, 1934.]

Pastac (I.). **La constitution des phénols et leur action anticryptogamique.** [The constitution of phenols and their anticryptogamic action.]—*Chimie et Indus.*, xxxi, 4 *bis*, pp. 1027–1032, 1934.

The fungicidal action of the phenols was shown by the writer's laboratory experiments to be closely related to their chemical constitution, while the number of radicals and their position in the nucleus exercises a direct influence on the fungicidal value of the molecule. Pyrocatechin (orthodioxybenzene) was found to be more active than resorcin (metadioxybenzene) [*R.A.M.*, xiii, p. 164], toxicity being correlated with the instability of the former product (the radicals of which occupy an abnormal position). Similarly, pyrogallol (1–2–3–trioxybenzene, abnormal isomer) is a more powerful fungicide than phloroglucin (1–3–5–trioxybenzene, normal isomer). The naphthols are more active than the phenols, the anticryptogamic effects of which may be augmented, however, by chloruration, nitrozation, and nitration, whereas they are almost completely counteracted by sulphonation.

SORAUER (P.). **Handbuch der Pflanzenkrankheiten. Erster Band. Die nichtparasitären- und Virus-Krankheiten. Zweiter Teil. Sechste, neubearbeitete Auflage.** [Handbook of plant diseases. Volume I. The non-parasitic and virus diseases. Part II. Sixth revised edition.]—viii + 553 pp., 129 figs., 11 diags., 7 graphs, Berlin, P. Parey, 1934.

In this part of the sixth revised edition of Sorauer's 'Handbook of Plant Diseases', issued under the supervision of Dr. O. Appel and his collaborators [*R.A.M.*, xiii, p. 114], the following aspects of phytopathology are considered: plant diseases caused by internal factors (K. O. Müller); unfavourable physical and chemical soil conditions as a cause of plant diseases (E. Pfeil); wounds inflicted by meteorological, human, and animal agencies, the reaction of plants to wounding and its effect on their general development, and the regenerative processes (O. Schlumberger); smoke and effluent injuries (E. Tiegs); and virus diseases, comprising a general section on etiology, symptoms, behaviour of the virus in the plant and *in vitro*, course of the disease in relation to external factors, manifestations of resistance, classification, and control, and a special section dealing with virus diseases (a) of Solanaceae and (b) of non-Solanaceous crops arranged by the crop (E. Köhler). The high standard of the previous part of this great work is well maintained.

COTTAM (C.). **Eelgrass disappearance has serious effects on waterfowl and industry.**—*Yearbook of Agric., 1934, U.S. Dept. of Agric.*, pp. 191–193, 1 fig., 1934.

The author states that one of the outstanding biological phenomena of recent times has been the sudden and nearly complete disappearance during the past two or three years of eelgrass (*Zostera marina*) [*R.A.M.*, xiii, p. 529] along the Atlantic coasts of North America and Europe. By far the greatest biological importance of this seaweed is the fact that normally it forms the staple winter food (over 80 per cent.) of sea brant geese and is an important food of several other species of waterfowl, the continued existence of which is seriously threatened by its disappearance; the latter is also affecting the fishery and shell-fishery industries, and has caused considerable erosion of many coastal areas.

Brief reference is also made to the many economic uses to which eelgrass has been put in Europe and North America, ranging from its employment as fuel, fertilizer, bedding material for man and cattle and the like, to its use in modern times for heat and sound insulating purposes in buildings. To illustrate the commercial importance of eelgrass, it is stated that in 1929 (probably the year of maximum production) two Boston firms alone imported 1,725 tons of the dried plant from Nova Scotia, and that in the past the exports from the Netherlands amounted to 2,000 to 3,000 tons annually. The price paid in the United States for the dried material delivered at the factory varied from $20 to $30 per ton.

While the factor or factors responsible for the destruction of eelgrass plants may have been operating unnoticed for a long period, the disease spread with a rapidity and sudden destructiveness hitherto unrecorded in botanical history. The first signs appeared

in midsummer of 1931 in most localities from North Carolina to New England and, before the summer was over, less than one per cent. of a normal stand of the plant remained intact in the sections affected. The leaves broke from their roots and washed ashore in great windrows. While it is not possible to foretell whether the plant will return in these areas to its normal abundance, in some places a progressive improvement has been noted since the first widespread destruction, particularly in the southern part of the eel-grass range along the North American coast. All available information indicates that, though there have been periods of scarcity in the past, none in the memory of man has been at all comparable with the present one. Though the cause of the disaster is not positively known, evidence is said to point strongly to a bacterial infection.

MacClement (D.). **Purification of plant viruses.**—*Nature*, cxxxiii, 3368, p. 760, 1934.

The following method, adapted from one used by Warburg and Christian for the purification of a water-soluble ferment (*Biochem. Zeitschr.*, ccliv, p. 440, 1932), has proved effective in the preparation of a purified suspension of any of the 'X' group of plant viruses [*R.A.M.*, xiii, p. 462]. Starting with volume *V* of extracted juice: (1) *V* is cooled to 0° C. and diluted to 15 *V* with water at 0°. Carbon dioxide is passed through the mixture at 0° for 30 minutes. This mixture is then centrifuged rapidly until a clear, straw-coloured supernatant is obtained (about 15 minutes at 3,000 r.p.m.). The precipitate, containing about one-third of the original solids, is discarded. (2) The supernatant is diluted to 200 *V* with water at 35° C., at which temperature carbon dioxide is passed for 15 minutes through the mixture; this is centrifuged for about one hour at 2,000 r.p.m. and the supernatant discarded. (3) The precipitate is suspended in *V* c.c. distilled water and centrifuged for about 15 minutes at 3,000 r.p.m., after which the precipitate is discarded. The supernatant, containing most of the virus and practically no protein, is faintly opalescent but colourless. In (1) the flask is immersed in a freezing mixture. In (2) the cautious use of a micro-burner will keep the temperature within half a degree of the optimum while the length of the period of centrifuging required to bring down the precipitate may be curtailed to 30 minutes or less by the use of higher speeds, as well as by adding a trace of aluminium sulphate or leaving the mixture in the cold overnight.

With virus 'X' from diseased tobacco plants, a final suspension can be produced by this method that will infect three out of five *Nicotiana glutinosa* plants at a dilution of 1/50,000 as compared with four out of five with crude sap at the same dilution.

Ainsworth (G. C.). **Virus disease investigations.**—*Nineteenth Ann. Rept. Cheshunt Exper. & Res. Stat., Hertfordshire, 1933*, pp. 54–64, 3 figs., 1934.

In 1933, spotted wilt [*R.A.M.*, xii, p. 730; xiii, p. 333] was less common in large tomato nurseries in Great Britain than in mixed

nurseries and gardens where other crops were also grown. Affected plants should be rogued out at once and the insect vector (*Thrips tabaci*) destroyed. *Primula sinensis*, *P. malacoides*, and *Gloxinia* were noted as new hosts.

Aucuba mosaic of cucumbers [ibid., ii, p. 491] was not observed for three years at Cheshunt, where ordinary or mild mosaic (synonyms, 'green cucumber mosaic' and 'cucumber mosaic') due to cucumber virus 3 [ibid., ix, p. 21; x, p. 60] predominates, and a third type with a wider host range, considered by Bewley to be distinct from aucuba, has appeared. When melons, gherkins, and *Cucumis maderaspatanus* were artificially inoculated with cucumber virus 3 a green mottle of varying intensity developed, accompanied by leaf distortion and stunting, but vegetable marrow and *Bryonia dioica* were not affected, all attempts to infect Solanaceous plants also giving negative results. Yellow cucumber mosaic (synonyms, 'cucumber mosaic' and 'white pickle' mosaic) [ibid., xi, p. 349; xii, p. 108] is more frequently present on vegetable marrow than on cucumber; it was also found occurring naturally on tomato, gherkin, *B. alba*, *Hyoscyamus* sp., and *Datura stramonium*. This virus (cucumber virus 1) was filterable through Pasteur-Chamberland filters; it was not very resistant to ageing *in vitro* (three days), heat, or chemicals. Tomato is rather easily infected, but the symptoms vary considerably. A very mild mottle without distortion or with slight narrowing of the leaves is common, but occasionally the severe 'fern leaf' type of distortion [ibid., ix, p. 417] is present. Melon, *B. dioica*, tobacco, and some other Solanaceous plants are susceptible. The use of clean seed greatly reduced the incidence of the disease.

When seed collected from tomatoes affected with glasshouse streak [ibid., xiii, p. 192] was tested for the presence of the virus it was found in the seed coats. The evidence showed that the virus is not carried over in the embryo but that the seedlings may become infected from the seed coats. The recommendation to save seed only from healthy plants therefore holds good for streak as well as aucuba mosaic of tomato [ibid., ix, p. 735].

KUNKEL (L. O.). **Studies on acquired immunity with Tobacco and Aucuba mosaics.**—*Phytopath.*, xxiv, 5, pp. 437–466, 7 figs., 1934.

In these studies except where otherwise stated the method of inoculation was by rubbing the leaves with a glass spatula covered with cheese cloth and moistened with juice from diseased plants of *Nicotiana tabacum*. The tomato aucuba mosaic originated from Rothamsted and the tobacco mosaic (Johnson No. 1) from Johnson himself. Tomato aucuba mosaic becomes systemic in tobacco (*Nicotiana sylvestris*) instead of forming necrotic lesions, if the plants are held at a temperature of 35° C. for three days, but if the plants are removed to greenhouses with a temperature too low to initiate systemic infection, the latter form of the disease persists. Various strains of aucuba mosaic have been obtained by varying the period of incubation at high temperatures but all are less severe than normal aucuba and are regarded as attenuated strains.

Cross-immunity studies have shown that plants infected by

attenuated strains of the tomato aucuba mosaic virus acquire immunity from the unattenuated virus [*R.A.M.*, xiii, p. 400]. Plants infected by the tobacco mosaic virus become immune from aucuba mosaic, except in the youngest leaves. Mature leaves of healthy plants heavily inoculated with tobacco mosaic acquire immunity from aucuba mosaic in the parts inoculated. Immunity resulting from systemic infection is closely associated with the invasion of the tissues by the mosaic virus and develops more slowly than that consequent on direct inoculation, which is manifested within two days.

There is little or no multiplication of the aucuba mosaic virus in tobacco tissues thus protected by a prior inoculation. The immunity resulting from direct inoculation develops both in old and young plants and extends to cells beyond the actual site of the operation.

Following the method described by Johnson [ibid., vi, p. 43] three attenuated strains of tobacco mosaic were secured and plants inoculated with these strains were found to become immune from both the tobacco and aucuba mosaic viruses. Tests to determine whether inoculation (by needles) with aucuba mosaic would establish immunization from tobacco mosaic failed, possibly on account of inadequate technique. Neither cucumber mosaic nor tobacco ring spot affords protection against aucuba mosaic on inoculation into tobacco plants.

PETHYBRIDGE (G. H.). **Potato diseases.**—*Journ. Min. Agric.*, xli, 2, pp. 125–136, 1934.

In this paper (read at a Potato Conference held at Rothamsted in February, 1934) notes are given designed to assist growers in reducing the losses due to various diseases (with special reference to transmission by the seed tuber), including dry rot [*Fusarium coeruleum*], common scab [*Actinomyces scabies*], skin spot (*Oospora pustulans*), blight (*Phytophthora infestans*), and wart (*Synchytrium endobioticum*). Referring to virus diseases, the author states that in trials of the copper strip test, recently introduced in Germany to discriminate between healthy and degenerate tubers [see next abstract], with leaf roll and healthy potatoes, both caused extensive blackening, so that for diagnosing leaf roll at least the method is apparently useless.

APPEL (O.). **Vitality and vitality determination in Potatoes.**—*Phytopath.*, xxiv, 5, pp. 482–494, 1934.

A full account is given of the application of Wartenberg's and Hey's potentiometric and Bechhold's and Erbe's copper methods of determining the vitality of potato tubers in relation to degeneration diseases (leaf roll, mosaic, and other causes) [*R.A.M.*, xii, p. 531; xiii, p. 465, and preceding abstract].

GRIEVE (B. J.). **Studies in bacteriosis. XX. The spraing disease of Potato tubers.**—*Ann. of Appl. Biol.*, xxi, 2, pp. 233–250, 2 pl., 1934.

After a brief reference to the confusion existing in the literature

dealing with the different forms of corky lesions in the flesh of potato tubers [cf. *R.A.M.*, xiii, p. 393], the author gives an account of his investigations, the results of which showed that the symptoms generally grouped in England under the name 'spraing or internal rust spot' in reality represent two different diseases, which the author suggests designating by the names 'spraing' and 'internal rust spot', respectively. The first, the symptoms of which are confined to the tuber alone, is characterized by arc-like lines or rings of suberized tissue, which are seldom visible on the outside of the tuber, and which, on cutting the affected tuber, appear to have originated from either a lenticel or a slight abrasion of the skin. The number of these rings is variable, and the focal point is often marked by a browning of the tissue just below a lenticel. Occasionally short arcs may be present, apparently unconnected with any surface lesion; such arcs form part of a connected system, although the connexion is not at first obvious. Sometimes, particularly in certain varieties, larger blotchy areas occur in a tuber, but their relation to the system of arcs can always be traced. This condition corresponds exactly to the Dutch potato disease 'kringerigheid' and the German 'Pfropfenbildung' [loc. cit.], and was clearly illustrated by Pethybridge in Ireland in 1913 ('Investigations on Potato diseases. IV.'—*Journ. Dept. Agric. and Tech. Instr. Ireland*, xiii, p. 468, 1913).

In internal rust spot, the flesh of affected tubers is marked with rusty-red to brownish lesions, which occur indiscriminately throughout the tissue and appear to form no connected system. The lesions may vary from mere specks to large, irregular blotch-like lesions having a diameter of 1 cm. or more. The number of spots may be very few in slightly affected tubers, but in cases of heavy development of the disease the rusty-coloured areas are numerous and very variable in size and shape, the severity of the disease appearing to be connected with varietal differences in the tubers. This condition corresponds in some measure to the German 'Eisenfleckigkeit' [loc. cit.].

Isolation experiments showed that neither *Bacterium rubefaciens* [ibid., xi, p. 320] nor *Bact. solaniolens* [ibid., iii, p. 420] occurs in spraing, but there was some slight evidence that bacteria may be concerned in the production of internal rust spot. Inoculations with these organisms consistently gave negative results with *Bact. solaniolens*, and though some slight evidence of infection was obtained with *Bact. rubefaciens*, the results were far from convincing. Spraing was transmitted by tuber grafting in three cases out of eighteen [ibid., vi, p. 179], and in one instance by a ground-up suspension of the arc lesions which was introduced into healthy tubers. All these results incline the author to support Quanjer's view of the virus origin of spraing [ibid., x, p. 746]. Internal rust spot could not be transmitted by tuber grafting, a fact which, together with the more constant occurrence of bacterial organisms in the lesions, suggests that this disease is distinct from spraing, and may possibly be of bacterial origin.

Attempts to isolate a possible infectious principle from the soil have so far given negative results.

Höhne (E.) & Chélard (G.). **Hat die Düngung einen Einfluss auf die Schorfbildung bei Kartoffeln?** [Does manuring influence scab development in Potatoes?—*Die Phosphorsäure*, iv, 3, pp. 161–167, 1934.

A fully tabulated account is given of the writers' four years' experiments at the Basic Slag Manufacturers' Agricultural Experiment Station, Berlin-Dahlem, on the effects of various fertilizer combinations on potato scab [*Actinomyces scabies*: *R.A.M.*, xiii, p. 466]. In the trials under discussion Richters Jubel remained practically free from infection notwithstanding the application of calcareous fertilizers and the clay-sandy soil with a reaction of P_H 6·86, while Lembkes Industrie was attacked both in the plots receiving basic slag and in those to which superphosphate was applied. The conclusion is reached that scab is avoidable by the cultivation of the officially recommended resistant varieties, coupled with the liberal use of green and stable manures.

Goss (R. W.). **A survey of Potato scab and Fusarium wilt in western Nebraska.**—*Phytopath.*, xxiv, 5, pp. 517–527, 1934.

A tabulated account is given of the writer's survey in 1928 of the incidence of scab (*Actinomyces scabies*) [*R.A.M.*, xii, p. 717] and wilt and stem-end rot (*Fusarium oxysporum* and *F. eumartii*) [ibid., vii, p. 597; xii, p. 241] in the high plains area of western Nebraska by planting one-bushel portions of a lot of formaldehyde-treated seed potatoes on each of a hundred farms, selected as representing the widest range of environmental conditions. No fields were entirely free from scab, the average percentages of which in all fields were 10·5 slight, 12·5 medium, and 1·4 severe, with an additional 30 per cent. of superficial infection. Stem-end rot or vascular discoloration was present in 94 per cent. of the fields, the average incidence for all fields being 4·5 per cent., about half of which was severe.

The following factors were found to be correlated with a high proportion of scab infection: cultivated soil or summer fallow the preceding year, as opposed to small grains, an interval of less than four years between potato crops, decreasing soil reaction from P_H 8·25 to 5·92, silt-loam soils as compared with loams or very fine sandy loams, and large numbers of the causal organism in the soil [cf. ibid., xiii, p. 466]. None of these factors appeared to influence the development of *Fusarium* wilt, the incidence of which was less, however, following legumes than after other crops.

Diehl (R.). **État actuel de la maladie verruqueuse de la Pomme de terre (la question des variétés).** [The present state of the Potato wart disease (the problem of varieties).]—*Rev. Path. Vég. et Ent. Agric.*, xxi, 1, pp. 25–31, 1934.

As a result of tests of European and American varieties of potato that were carried out since 1926 at Russ Hersbach, Bas-Rhin, a list is given of 160 [named] varieties, classified by their resistance or susceptibility to the potato wart disease (*Synchytrium*) [*endobioticum*] and by the country of their origin. The disease is stated to be slowly gaining ground in France, owing to the fact that a large proportion of the varieties commonly used there are

susceptible, and a further list is given of resistant varieties which might usefully replace them. Slightly susceptible varieties, e.g., Ursus and Triumph, should not be used in threatened areas, as they may serve to carry infection.

Mention is also made of preliminary tests of a number of other tuberiferous species of *Solanum* collected by Russian expeditions in South America, the results of which showed that most of them appear to be susceptible to wart disease. Of 27 samples of *S. andigenum* tested only four were found to be resistant, while susceptible types were also found among specimens of ten other South American species of *Solanum*, a list of which is appended [cf. ibid., iv, p. 502].

Reddick (D.). **Elimination of Potato late blight from North America.**—*Phytopath.*, xxiv, 5, pp. 555–557, 1934.

In addition to the blight (*Phytophthora infestans*) -immune Mexican species of *Solanum* already recorded [*R.A.M.*, xiii, pp. 52, 468], the following are listed here: *S. coyoacanum*, *S. verrucosum*, *S. polyadenium*, *S. sambucinum*, and *S. bulbocastanum*. In hybridization experiments at Ithaca with *S. demissum* as the pollen parent, a very scanty set of seeds has been produced only five times, each time on Rural or its hybrids. The F_1 hybrids are all blight-immune and practically male-sterile, less than 100 individuals of the F_2 having been produced. The property of immunity from blight was found to be heritable, though the mode of transmission cannot be determined from the meagre material available. Nearly all the F_1 plants (90 per cent.) arising from crosses between *S. demissum* as the female parent and cultivated varieties are also blight-immune, while in the F_2 and subsequent generations (or at any rate down to the fourth) reversion to the wild type occurs, with total immunity. The progeny from an immune F_1 plant back-crossed with pollen from a cultivated variety is heterogeneous; of 1,762 plants tested 68 per cent. were immune and a fair proportion yielded tubers approximating to commercial size. When a blight-immune back-cross plant is again back-crossed with pollen from a cultivated variety, heterogeneity is again manifested by the progeny. Of 767 such double back-crossed plants 50 per cent. proved immune from *P. infestans*. From about 200 immune double back-cross plants, a dozen plants have been selected that have the appearance of domestic varieties and about a dozen others approximating to commercial types.

Wei (C. T.). **Rice diseases.**—*Nanking Coll. of Agric. & Forestry Bull.* (*New Series*) 16, 40 pp., 28 figs., 1934. [Chinese, with English summary.]

Between 1930 and 1933, the following organisms causing diseases of rice (arranged in descending order of importance) were observed in the vicinity of Nanking: *Helminthosporium oryzae* [*R.A.M.*, xii, p. 146], *Piricularia oryzae* [ibid., xiii, p. 267], *Rhizoctonia* sheath rot [*Corticium sasakii*: ibid., xiii, p. 264], *Fusarium* blight [(?) *Gibberella fujikuroi*: ibid., xiii, p. 396], *Ectostroma* black stripe, green smut (*Ustilaginoidea virens*), *Phoma* kernel blight [(?) *P. glumarum*: ibid., xiii, p. 592], *Pyrenochaeta oryzae*, *Meta-*

sphaeria albescens, *Sclerotium oryzae* [*Leptosphaeria salvinii*: ibid., xiii, p. 395], *Tilletia horrida* [ibid., xiii, p. 469], *Gibberella saubinetii* [ibid., xiii, p. 263], *Ophiobolus oryzae*, *Brachysporium oryzae* [cf. ibid., xii, p. 146], *Sclerotium sphaerioides*, and *Nigrospora oryzae* [loc. cit.], as well as some obscure or non-parasitic troubles.

In cultures of *H. oryzae* 0- to 3-septate, hyaline spores with a *Hormodendron*-like arrangement, borne on conidiophores and measuring 9·5 to 32 by 4 to 5·5 μ, were noted in addition to the normal conidia.

The conidial stage of *M. albescens* occurred in a germination test and in culture, the hyaline, allantoid to spindle-shaped, usually 1-septate spores measuring 6 to 15 by 3 to 5 μ.

Smith (F. E. V.). **Report on Pimento disease in the parish of Manchester.**—*Journ. Jamaica Agric. Soc.*, xxxviii, 5, pp. 276-279, 1934.

In April, 1934, a new disease of pimento [*Pimenta acris*] was observed in Jamaica, where it is prevalent over a large part of the parishes of Manchester and St. Elizabeth and occurs in a mild form in other parts of the island. Only the young parts of the trees are attacked. Circular (occasionally irregular) spots, reddish on the upper surface and yellowish, becoming greyish-brown, on the lower, appear on the young leaves; numerous lesions develop on the emerging shoots, the tips of which frequently wither. When the flowers are attacked, the spots appear on the stalks and serious blossom-fall may ensue, with consequent reduction of crop. If the trees have blossomed before becoming infected a large scar frequently forms on the half-grown berries. The type of attack varies considerably on individual trees; in the same field one tree may show no twig die-back and very little leaf spot, but heavy berry infection, whereas on others the blossoms, leaves, and young twigs may all be heavily diseased. The intensity of the attack varies with the district and even with different parts of the same estate. The worst infections are in the south, especially in the localities most exposed to the wind.

The disease is due to a rust, thought to be possibly a species of *Hemileia*, the author's identification of which, however, awaits confirmation. It is thought that the fungus has been present in Jamaica for a long time and that the outbreak (probably favoured by heavy, out-of-season rains during the previous eighteen months), may subside with a return to drier conditions.

Bolle (P[ierrette] C.). **De onderscheiding van gomziekte en daarop gelijkende verschijnselen.** [The differentiation of leaf scald and conditions resembling it.]—*Arch. voor Suikerind. Nederl.-Indie*, Deel I, xlii, 10, pp. 331–334, 5 pl., 1934.

In connexion with a brief discussion of Miss Wilbrink's survey of leaf scald of sugar-cane [*Bacterium albilineans*] and similar manifestations [*R.A.M.*, xii, p. 593], the writer presents in tabular form the typical symptoms of five conditions liable to confusion, viz., leaf scald, fourth disease, wilting of the 'rajoengan', false leaf scald, and chlorotic striping of the leaves following the attacks of a moth (probably *Cosmopterix dulcivora*).

In Hawaii, fourth disease is known as 'chlorotic streak' [ibid., xii, p. 723; xiii, p. 472] and the writer observed it there on the P.O.J. 36 variety. In general, varieties highly susceptible to leaf scald are less so to fourth disease and vice versa.

In false leaf scald, the stripes run between two large vascular bundles and not round them as in the foregoing disturbances. Possibly this is merely a form of the variegated stripes ('soerats') already described by Miss Wilbrink.

Various nutritional deficiencies, e.g., of iron, may lead to the development of chlorotic symptoms resembling those of leaf scald, but in such cases it is the intercostal areas that are affected.

Neither fourth disease nor wilting of the 'rajoengan' has been found infectious, and neither they nor any of the other above-mentioned disturbances, apart from leaf scald, are of any economic importance.

Booberg (G.). **Over het gebruik van gelestrepenziek plant-materiaal.** [On the use of mosaic-diseased planting material.] —*Arch. voor Suikerind. Nederl.-Indie,* Deel I, xlii, 10, pp. 319–331, 4 graphs, 1934.

From a study of the statistical data [which are discussed and tabulated] on the transmission of mosaic disease of sugar-cane through the setts in Java [*R.A.M.*, vi, p. 379; ix, p. 161] the writer concludes that a clear distinction should be made between 'liability to infection' and 'susceptibility' in connexion with mosaic. E.K. 28 and D.I. 52, for instance, are equally liable to infection but the former is much the more susceptible of the two. During the last six years the general use of the resistant P.O.J. 2878 led to the question of mosaic being pushed into the background, but the extreme susceptibility of certain new varieties has once more brought it into prominence. The use of selected, healthy setts is strongly recommended; should it be absolutely necessary to plant diseased material an isolated site must be chosen.

Heck (A. F.). **Some indications of a relation of soil fertility and plant nutrition to Cane diseases in Hawaii.**—*Journ. Amer. Soc. Agron.*, xxvi, 5, pp. 381–389, 1934.

A tabulated account is given of the writer's chemical studies on Hawaiian sugar-cane soils and on the cane juice which are considered to indicate a correlation, positive or negative as the case may be, between readily available plant nutrients and susceptibility to certain diseases.

Root rot, associated with *Pythium aphanidermatum* [*R.A.M.*, xiii, pp. 399, 471], is believed to be steadily increasing both in severity and extent. A low phosphorus and high mineral nitrogen content are outstanding features of the soils in which Lahaina (and of late other varieties also) are affected by this disease, which is regarded as an expression of unbalanced nutrition.

Eye spot (*Helminthosporium sacchari*) [*H. ocellum*: ibid., xii, p. 722; xiii, p. 12] is also usually found on soils with a high mineral nitrogen content, and is possibly correlated with low potassium. The greatest damage is stated to be caused by the so-called 'runner' (the narrow strip of necrotic tissue extending

from the actual area of invasion to the leaf tip) rather than by the lesion itself.

Brown stripe (*H. stenospilum*) [loc. cit.] has been found to be associated with low mineral assimilation by the cane, either of phosphorus, potassium, or both. Resistant varieties, such as P.O.J. 36, are either better feeders on the available phosphorus and potassium in the soil, or are able to make normal growth by the use of less of these nutrients in their metabolism, thus leaving more in solution in the juice.

RAYSS (T.). **Deuxième contribution à la connaissance des Micromycètes des environs de Besse (Puy-de-Dôme).**—[Second contribution to the knowledge of the Micromycetes in the neighbourhood of Besse (Puy-de-Dôme).]—*Bull. Soc. Myc. de France*, xliv, 3–4, pp. 381–421, 3 figs., 1 graph, 1934.

This is a briefly annotated list (in continuation of a previous list published in *Bull. Soc. Myc. de France*, xlvii, 2, pp. 200–220, 1931), arranged in the systematic order of the organisms, of 163 species of fungi belonging to 21 genera which were collected in the neighbourhood of Besse, Puy-de-Dôme, France, and include many parasites. One of the species is described as new to science and named [with a Latin diagnosis] *Peronospora moreaui*, on *Lathyrus macrorhizus*. The hosts are indicated in every case.

MAYOR (E.). **Notes mycologiques. VIII.** [Mycological notes. VIII.]—*Bull. Soc. Neuchâtel Sci. Nat.*, lviii, pp. 7–31, 1933. [Received July, 1934.]

Notes are given on 52 species of fungi, mostly rusts, recorded during 1930–3 in Neuchâtel Canton [*R.A.M.*, ix, p. 409]. The following items are of special interest. *Oidium hortensiae* [*Microsphaera polonica*: ibid., xii, p. 550] was observed in April 1932 on *Hydrangea hortensia*, and recurred in May, 1933, on the same plants. *Entyloma dahliae* [ibid., xii, pp. 177, 550] was not present in 1930 on any of the dahlia varieties affected the year before [ibid., ix, p. 409], but heavy infection developed on all of them by September, 1931, and the disease was very severe in 1932. The attack spread very rapidly on cactus dahlia seedlings grown from American seed.

Puccinia baryi is very common in Switzerland on *Brachypodium pinnatum* and *B. sylvaticum*. In May, 1932, the author inoculated *Berberis vulgaris* plants in a greenhouse with teleutospores taken the previous September from *B. sylvaticum*, and in 13 days slight but distinct infection was present and pycnidia were rapidly forming. Mature aecidia were observed a week later. The experiment was repeated in April, 1933, when considerable infection was visible in five days and some of the aecidia were mature in less than three weeks. On barberry the rust causes sparse spots, 2 to 4 mm. in diameter, orange or red in colour, often vinaceous in the centre, and surrounded by a light yellow zone. The pycnidia develop on the upper surface of the leaf, the aecidia on the lower; the latter are barely $\frac{1}{3}$ mm. in diameter and when mature have a thick, pale yellow edge, slightly if at all torn. In every respect the aecidia resembled those of *P. pygmaea* [ibid., xii, p. 536]. The

aecidiospores of *P. pygmaea* are rounded, 18 to 24 μ in diameter or elongated, 21 to 27 by 16 to 24 μ, the corresponding measurements for *P. baryi* being 19 to 24 and 24 to 27 by 16 μ. The membrane, which is of uniform thickness, is finely verrucose, and though thin is appreciably thicker than that of *P. graminis*. The inner wall of the peridial cells of *P. pygmaea* and *P. baryi* is markedly verrucose and thicker than that of *P. graminis*. Microscopically the aecidia of *P. pygmaea* and *P. baryi* resemble those of *P. arrhenatheri* [loc. cit.], but, like *P. graminis*, they occur on leaves which do not become deformed.

Milesia kriegeriana [ibid., ix, p. 420] is well known in Switzerland in its uredo and teleuto stages on the fronds of *Dryopteris filix-mas* and *D. spinulosa*. In September, 1930, the white aecidia were noted on *Abies alba* near *D. filix-mas* plants which bore numerous uredosori. On 25th July, 1931, aecidia were collected from *A. alba* in another locality and placed in close contact with young healthy fronds of *D. filix-mas*. On 10th August infection had taken place and the first uredosori matured two days later. Similar inoculations were made on 16th July, 1932; by 1st August the first uredosori were mature and by 13th abundant infection was present. A detailed description is given of the pycnidia and aecidia of the fungus as found on the current year's needles of *A. alba*.

Tai (F. L.) & Wei (C. T.). **Notes on Chinese Fungi. III.** *Sinensia* (*Contr. Metrop. Mus. Nat. Hist. Acad. Sinica*), iv, 5, pp. 83–128, 55 figs., 1933. [Received August, 1934.]

This annotated and illustrated list, in continuation of those previously published [*R.A.M.*, xii, p. 661], comprises 58 species of Peronosporaceae, including five considered to be new species and one new combination. Among the fungi listed are *Sclerospora graminicola* on *Setaria viridis* [see above, p. 629] and *S. glauca*, *Plasmopara skvortzovii* Miura on *Abutilon avicennae*, *Peronoplasmopara* [*Pseudoperonospora*] *cubensis* on cucumber, vegetable marrow, melon, and *Luffa cylindrica*, *Peronospora manshurica* on *Glycine max* [ibid., xi, p. 316], *Empusa grylli* on *Locusta migratoroides* [ibid., xii, p. 9], *Ophionectria coccicola* on scale insects on the branches of *Citrus nobilis*, *Ustilago tulipae* on the leaves of *Tulipa edulis*, *Uromyces caryophyllinus* on *Dianthus longicalyx*, *Stereostratum corticioides* (B. et Br.) P. Magnus (*Puccinia corticioides* B. et Br.), *P. longicornis*, and *P. phyllostachydis* on *Phyllostachys*, *Puccinia horiana* and *Uredo autumnalis* on *Chrysanthemum indicum*, and *Pileolaria pistaciae* n. sp. on *Pistacia chinensis*.

In a previous publication [ibid., xi, p. 131] the senior author tentatively identified a species of *Myriangium* collected at Nanking as *M. bambusae* Rick, but an examination of type material of the latter showed it to be quite different from the Nanking fungus, material of which was sent to Hara, who recognized it as *M. bambusae* Hara; as this name, however, is a homonym the new name *M. haraeanum* nom. nov. is proposed.

Gymnosporangium haraeanum Syd. and *G. japonicum* Syd. both occur on *Juniperus chinensis*. The former, amongst the synonyms of which are *G. japonicum* Shirai, non Sydow, *G. asia-*

ticum Miyabe, and *G. koreanse* [ibid., xii, p. 396] has for alternate hosts species of *Pyrus*, *Cydonia*, and *Crataegus* [ibid., xiii, p. 37], while those of *G. japonicum* are *Photinia subumbellata* and *P. villosa*.

The sclerotia of *Poria cocos* are known in China as 'fuhling'. The perfect stage of the fungus was artificially produced by placing fresh sclerotia in moist chambers, and also by cultures on potato glucose agar. It is considered to be identical with the American tuckahoe or Indian bread [ibid., ix, p. 572], and probably also with the Japanese 'bukuxyo', known usually as *Pachyma hoelen*. Fuhling is used in Chinese medicine, and under the name of Chinese root is annually exported in amounts averaging 20,000 piculs [over 1,000 tons]. In southern Honan it is cultivated on small pine poles buried in hill slopes except for one end, which is either inoculated with small flakes of sclerotium or gets naturally infected. At Tai-hu Hsien, Anhwei, the process is more complicated, involving subculturing twice on buried poles before the main crop is grown in a manner similar to that described above.

The name *Cercospora vignae-sinensis* nom. nov. is suggested for the cowpea leaf-spotting organism in place of *C. raciborskii* Matsumoto and Nagaoka (proposed in 1931 to replace *C. vignae* Rac. which was antedated by *C. vignae* E. & E.), as this specific name has already been used for *C. raciborskii* Sacc. & Syd. [on tobacco: ibid., xi, p. 129].

Cozic (Mlle). **Étude biochimique de Bacterium xylinum.** [A biochemical study of *Bacterium xylinum*.]—*Rev. Gén. de Bot.*, xlvi, 541, pp. 1–32; 542, pp. 75–87; 543, pp. 157–171; 544, pp. 209–228; 545, pp. 268–288; 546, pp. 337–359, 16 graphs, 1934.

A detailed account is given of the writer's comprehensive studies on the biochemical aspects of the well-known acetifying organism *Bacterium xylinum*, which is used in the preparation of a tea beverage in Central and Eastern Europe [and also in the East: *R.A.M.*, xii, p. 661]. The following are among the headings under which the subject is discussed: morphology, nature of the cellulosic membrane, appropriate culture media, factors affecting growth, taxonomy, preparation of sugars and polyalcohols, metabolism, action of stains on growth and respiration, oxido-reduction phenomena, inhibition of development by the esters of bromacetic acid and other substances, and the effects of potassium cyanide on the vital functions of the organism.

An eight-page bibliography is appended.

Thompson (A.). **Diseases of Tobacco in Malaya.**—*Malayan Agric. Journ.*, xxii, 6, pp. 263–269, 1934.

The most serious disease of tobacco in Malaya is slime disease (*Bacterium solanacearum*) [*R.A.M.*, xiii, p. 475] which is found locally on Deli, Burmese, Joyner, Hickory Prior, White Burley, Russian, Bhengi, and Ceylon tobaccos. In some Joyner plants the disease appeared just before topping; this operation was carried out with a knife, and a few days later a black discoloration was observed to extend down the cut stem and pass into the lower

leaves of previously healthy plants. It is considered probable that infection was carried on the knife. As experience indicates that the disease can cause as much damage in Malaya as in the Dutch East Indies, if large areas in the former locality are to be sown to tobacco, rotation with rice, maize, and *Mimosa invisa* [ibid., ix, p. 349] for seven or eight years may be found necessary.

The leaf spot due to *Cercospora nicotianae* [ibid., xiii, p. 545] is also very common, but it causes very little damage and is not regarded as serious.

The symptoms, manner of spread, and control of tobacco mosaic are briefly described.

Vinson (C. G.). **Possible chemical nature of Tobacco mosaic virus.**—*Science*, N.S., lxxix, 2059, pp. 548–549, 1934.

Contrary to the experimental results of Barton-Wright and McBain, the writer has detected small amounts of nitrogen in safranin precipitates, prepared in the same way, of the virus extracted from mosaic Turkish tobacco plants at Missouri University [*R.A.M.*, xiii, pp. 400, 475]. The nitrogen content of the final virus fraction may be extremely low (only 1 to 2 mg. from 500 c.c. juice), with a correspondingly slight infective capacity. However, when the leaves of ten plants were rubbed with a cloth dipped in the virus preparation, 100 per cent. infection was produced.

Phosphorus was found to be present in the washed safranin precipitate to the extent of about one half mg. per 500 c.c. of juice. In most of the writer's preparations the virus fraction is readily precipitable by means of a small amount of N/1 aluminium sulphate solution, but this does not hold good for those obtained by the amyl alcohol procedure.

Takahashi (W. N.) & Christensen (R. J.). **The virucidal action of high frequency sound radiation.**—*Science*, N.S., lxxix, 2053, pp. 415–416, 1934.

Using an apparatus similar to that described by Harvey *et al.* (*Biol. Bull.*, lv, p. 459, 1928), the writers carried out experiments to determine the effect of high frequency sound radiation on the tobacco mosaic virus. The sound radiation originated in the vibration of a 1 in. sq. quartz crystal immersed in a water-cooled, circulating oil bath and excited by means of a 75-watt vacuum tube oscillator in connexion with a step-up voltage arrangement. The natural frequency of the crystal was 450,000 cycles per second. Three c.c. of centrifuged juice from crushed, frozen tobacco leaves were pipetted into a small test-tube, the end of which was enclosed in a thin-walled bulb about 1 in. in diameter; the latter was immersed in the oil bath directly above the quartz crystal. Separate samples from the same lot of juice were irradiated for 30, 60, and 120 minutes. After each test the temperature of the liquid within the bulb was found to have risen from 24° to about 35° C., but this increase was found to play no part in the inactivation of the virus, the total number of local lesions formed on 20 half leaves of *Nicotiana glutinosa* inoculated by the method of Holmes [*R.A.M.*, viii, p. 532] and Samuel and Bald [ibid., xii, p. 526] being 1,052

for juice held at 35° and 1,058 for unheated. The numbers of local lesions per 20 half leaves inoculated with juice subjected to 30, 60, and 120 minutes' sound radiation and diluted 1 in 500 were 50, 9, and 0, respectively, compared with 980, 1,446, and 872, respectively, for untreated, similarly diluted juice. The corresponding figures for a similar experiment but with juice diluted 1 in 50, were 584, 52, 0, and 1,301, 1,218, and 1,116, respectively.

The results of these and five other experiments are considered to denote that the tobacco mosaic virus undergoes progressive inactivation with increasing periods of exposure to sound radiation.

Van Der Poel (J.). **De invloed van den basentoestand van den grond op Tabaksbibit en eenige andere tropische gewassen in Deli.** [The influence of the basic reaction of the soil on Tobacco seedlings and a few other tropical crops in Deli.]—*Bull. Deli Proefstat. te Medan-Sumatra*, 31, 64 pp., 1934. [English summary.]

In order to determine the influence of the basic soil reaction on the growth of various tropical crops at Deli, Sumatra, and on the incidence of slime disease (*Bacterium solanacearum*) in tobacco and *Ricinus communis* [see above, p. 657], these crops were experimentally grown on the three principal soil types of the Deli tobacco belt, viz., black dust rich in humus ['zwarte stofgrond'], red dacitic with a low humus content, and alluvial sandy loam, adjusted towards the acid side by the admixture of flowers of sulphur, and towards alkalinity by that of hydrated lime and marl.

Tobacco seedlings grown on the acid plots of the black dust soil (P_H 3·9 or 4·1) developed spoon-shaped, dark green, brittle leaves and a defective root system. At P_H 4·5 the leaf symptoms were similar but the roots were somewhat better developed. On the loam plots receiving an acid fertilizer (P_H 3·7) the plants showed chlorosis of the leaves, except for the veins, while necrotic spots developed on those grown at P_H 7·9, 7·8, and 7·5. Slime disease did not affect tobacco or *R. communis* on the strongly acid or alkaline plots. An experiment with tomatoes in zinc trays showed that slime-sick soil from the fields could be freed from infection by treatment with bicarbonate of potash or tobacco ash, so that lime compounds are not specific in their action against *Bact. solanacearum*.

Top rot, tentatively attributed to boron deficiency [ibid., xiii, p. 600], occurred exclusively among the tobacco plants in plots with a strong alkaline reaction (87 to 90 per cent. at P_H 7·9 to 8, compared with 41 per cent. at P_H 7·7 and none at P_H 7·5).

Bewley (W. F.). **Tomatoes: cultivation, diseases, and pests.**—*Min. of Agric. and Fish. Bull.* 77, v+71 pp., 4 pl., 1 plan, 1 diag., 1934.

This very useful publication, based on the knowledge that has been attained at the Cheshunt Experimental and Research Station, deals at length with the cultivation of the tomato under glass in Great Britain, and contains also information on the construction and heating of tomato houses. A special section is given to a brief description of the common diseases of the crop, which are dealt

with under the following headings: seedling and young plant diseases, root diseases and wilts, stem diseases, leaf diseases, virus diseases, fruit diseases, and physiological disorders [see below, p. 663], and also of the more important insect pests. Control measures are briefly indicated in each case.

CALDWELL (J.). **The physiology of virus diseases in plants. V. The movement of the virus agent in Tobacco and Tomato.** —*Ann. of Appl. Biol.*, xxi, 2, pp. 191–205, 1 pl., 1934.

The results of continued experiments with the virus of aucuba or yellow mosaic of tomato [*R.A.M.*, xii, p. 527] showed that in inoculated plants the symptoms of the disease only appear in those tissues which have developed after infection, and that the virus may be present in apparently normal tissues, in the absence of any macroscopic symptoms. It is much more abundant in chlorotic spots than in the normal green tissue of mottled young leaves, the ratio in inoculated tomato plants being of the order of 5 to 1. The same was also true of tobacco plants inoculated with Johnson's No. 1 tobacco mosaic, but in this case the ratio was of the order of about 20 to 1, the difference being explicable by the difficulty of cutting out test discs of green tissue free from all traces of chlorotic tissue from tomato leaves. The results are considered to indicate that the multiplication of the virus is not uniform throughout the tissues of the host plant, and that not only do adult tissues not induce much multiplication but that there is some factor, at present not clearly understood, which makes certain irregular areas of the developing tissues unsuitable for multiplication of the virus.

Reference is also made to a large series of experiments, in which the transmission was tested of the virus agents of tobacco mosaic, hyoscyamus III [ibid., xii, p. 243], and 'green' by tobacco seed, and of aucuba mosaic, tobacco mosaic, streak, and spotted wilt by tomato seed. The fact that in no case was any evidence of transmission obtained would indicate that the chance of seed transmission of these viruses is very slight.

In a further set of experiments, the movement was studied of the virus of tobacco mosaic from inoculated tobacco leaves which were exposed to light or were completely darkened after inoculation by being enclosed in a black cloth envelope. The results showed that the virus can move independently of the food materials, and that under certain conditions, the virus apparently moves in a direction opposite to that of the metabolites.

CALDWELL (J.). **The physiology of virus diseases in plants. VI. Some effects of mosaic on the metabolism of the Tomato.** —*Ann. of Appl. Biol.*, xxi, 2, pp. 206–224, 2 pl., 7 graphs, 1934.

The results of the experiments briefly described in this instalment of this series showed that the amount of distortion and chlorosis induced in the tomato (Kondine Red variety) by the aucuba or yellow mosaic virus [see preceding abstract] depends on the stage in the development of the host at which it was inoculated, the symptoms being much more uniform and pronounced in plants infected as seedlings than at a later stage (e.g., the fifth

normal leaf stage). This effect is correlated with the fact that the virus inhibits the formation of chloroplasts but does not affect those already formed. Since the number of chloroplasts depends more or less on the leaf area of the plant, it follows that plants inoculated as seedlings, which have the least number of preformed chloroplasts, are much more starved as compared with the controls than are those which are inoculated when they have a number of well-developed leaves in full photosynthetic activity. This conclusion was well supported by the analytical determination of the dry matter and total carbohydrates content, which showed that in plants that were inoculated at the seedling stage the dry matter content was of the order of 7 to 8 per cent., in those inoculated at the fifth normal leaf stage of the order of 10 to 12 per cent., and in the controls of 14 to 15 per cent. The content of total carbohydrates was found to be 1·1, 1·3, and 1·6 per cent., respectively. The nitrogen content was not materially affected. The work also indicated that the stage of development of the host is not apparently affected by the disease, since the diseased plants, though reduced in size, had the same number of leaves and flower trusses as the controls, independently of the stage at which they had been inoculated.

In experiments to establish the effect of the virus on the respiratory mechanism of the host tissues it was found that the CO_2 output of the infected tissues is higher than that of the controls, as expressed in mg. of CO_2 per three-hour period in terms of the initial fresh weight, the residual dry matter content, or the residual nitrogen content. This higher CO_2 output was also found when the plants were kept in oxygen or nitrogen atmospheres. It is attributed to an increase brought about by the virus in the efficiency of the enzyme system in the diseased plants.

READ (W. H.). **Physiological investigations of mosaic disease of the Tomato**—*Nineteenth Ann. Rept. Cheshunt Exper. & Res. Stat., Hertfordshire, 1933*, pp. 64–67, 1934.

Examination in localities in England where severe outbreaks of tomato mosaic occur every year showed that the subsoil was almost invariably wet and sour. When the variations in the carbohydrate metabolism of healthy tomato plants and others artificially inoculated with aucuba mosaic [see preceding abstract] were studied by analysis of samples taken at intervals of two hours throughout a period of twenty hours the results obtained suggested that in the laminae of tomatoes affected with aucuba mosaic there is a time-lag in the conversion of reducing into non-reducing sugars [*R.A.M.*, xii, p. 732]. In the healthy laminae the concentration of reducing sugars rose during the day until it reached a maximum at 3 p.m. In the diseased laminae the amount of reducing sugars rose to a maximum at 3 p.m. and then fell rapidly, while the concentration of the non-reducing sugars began to increase at noon, reaching a maximum only at 6 p.m. The mean concentration of reducing sugars in the healthy and diseased laminae showed little difference, but the amount of non-reducing sugars was much greater in the former. The starch values showed no marked difference apart

from slightly greater amounts in the healthy laminae, a result at variance with those of previous experiments [loc. cit.]. Examination of the petioles showed that in healthy plants reducing sugars were present in larger amounts than non-reducing sugars; the latter showed little variation throughout, but the amount of reducing sugars present rose to a maximum at 6 p.m. and fell to a minimum at 2 a.m. In the diseased petioles reducing and non-reducing sugars were present in approximately equal amounts between 8 a.m. and 7 p.m., showing the same maxima at noon and 6 p.m.

BALD (J. G.) & SAMUEL (G.). **Some factors affecting the inactivation rate of the virus of Tomato spotted wilt.**—*Ann. of Appl. Biol.*, xxi, 2, pp. 179–190, 3 graphs, 1934.

In continuation of their studies of the properties of the virus of tomato spotted wilt [*R.A.M.*, xi, p. 549; xii, p. 526] the authors give a brief account of experiments, the results of which showed that stirring the inoculum during the process of inoculation accelerated the speed of its inactivation, the same effect also resulting from bubbling air through the inoculum, and also from the addition to it of either of the two oxidizing agents, chloramine T or hydrogen peroxide. A slight delay in the loss of virulence was obtained by the removal from the inoculum of all but traces of free oxygen by bubbling nitrogen through it, but the final rate of inactivation remained practically unchanged. Of the six reducing agents which were tested, ferrous sulphate, tannic acid, hydroquinone, and cysteine hydrochloride accelerated inactivation, sodium nitrite retarded it slightly, while sodium sulphite retarded it very markedly, these varying effects being possibly due to differences in hydrogen-ion concentration, or to various unrelated properties of the introduced ions; it is pointed out, in particular, that nothing was known of the oxidation-reduction potentials which were actually induced in the inoculum by the addition of the reducing substances.

These results do not yet decide the question whether the inactivation of the virus of tomato spotted wilt on standing is due to a reaction of the nature of an oxidation, and further work is now in hand, in which account is being taken of the factors indicated above.

MCWHORTER (F. P.). **English form of Tomato spotted wilt found in Oregon greenhouse.**—*Plant Disease Reporter*, xviii, 3, pp. 25–26, 1934. [Mimeographed.]

When inoculations by rubbing were made to the leaves of petunia plants from tomatoes grown in a greenhouse in Oregon (from seed directly imported from England) and showing symptoms of a disease unfamiliar to the grower but recognized at the State College to resemble spotted wilt [*R.A.M.*, xiii, p. 333 and preceding abstract], positive results were obtained in all cases, the rubbed leaves developing lesions typical of the English form of the disease as described and figured by K. M. Smith [ibid., xii, p. 59]. As this

is considered by Smith to be a conclusive test for the disease, the presence of spotted wilt in Oregon is held to be established.

Bewley (W. F.). **Some physiological disorders of glasshouse crops.**—*Ann. of Appl. Biol.*, xxi, 2, pp. 319–322, 1934.

In this note the author gives brief descriptions of the more important physiological troubles which affect tomatoes and cucumbers grown under glass in England. The following tomato troubles are discussed. Blossom-end rot, due to a disturbance of the balance in water requirement between foliage and the developing fruit. Bronzing of the tissue immediately under the skin of the fruit, believed to be connected with the development of excessive top growth followed by a check due to hot dry soil. Blotchy ripening, sometimes known as 'bad penny' or 'waxy patch', characterized by green patches on the fruit, which may assume a yellow or orange colour during ripening but never reach the full red colour; this is a nutritional disorder occasioned by deficiency of nitrogen and more particularly of potash, and in many cases it may be remedied by the addition of a phosphatic manure which assists the plants to take in additional potash from the soil, and also by subsoil manuring. Potash deficiency was also shown to be responsible for the condition known as 'green back', in which the fruit develops a green patch around the stalk end; this area remains hard and changes to a greenish yellow during the process of ripening. Another important factor contributing to this last condition is high temperature, which inhibits the production of the red lycopin pigment, and a measure of control may be obtained by providing adequate shade to the fruits while ripening. Blossom drop was shown to be due to dry soil conditions, and the condition known as 'dry set' to arise directly from failure of pollination, generally under conditions of air humidity insufficient for germination of the pollen grains; it may be prevented by spraying the plants with water as soon as the flowers begin to open. The 'hollow fruit' trouble is the result of irregular development due to alternations of rapid and slow growth. A disorder which has recently given trouble is 'oedema' or 'dropsy', in which furry blisters are found on the underside of the leaves and on the fruit stalks, followed by considerable twisting and distortion of the leaves and shoots; this is due to excessive water-supply to the roots, and does not occur in well-lighted, reasonably dry, and moderately watered houses. Of the two troubles that may develop during marketing of the fruits, mottling occurs when the temperature is too high for the proper formation of the red pigment, and softness of the fruit is due to bad ventilation of the boxes.

The only disorder of the cucumber dealt with is the one usually known as 'damping-off' of the fruits. It is due to a weakened constitution of the plants induced by imperfect root development, root decay, or the strain of intensive fruit production, and may be controlled by allowing the plants to rest by ventilating the houses and leaving the beds to dry, the foliage being maintained by 'damping down' the house at regular intervals. After seven to ten days of this treatment the plants should be trimmed, and the beds dressed with good compost and watered.

VANINE (S. I.). Методы исследования грибных болезней леса и повреждений древесины. [Methods for the investigation of fungal diseases of forest trees and injuries to timber.]—228 pp., 95 figs., 4 graphs, Гослестехиздат. [State Forestry Techn. Publ. Office], Leningrad, 1934.

The subject of forest pathology is discussed in a somewhat elementary fashion, while more detailed consideration is given to technical methods for the notation of the incidence and severity of attack of fungal diseases in forest stands, isolation and culturing of the causal organisms, and their identification. Timber-rotting and-staining fungi are similarly dealt with in a separate chapter. The main feature of the book is the inclusion in it of keys for the determination of the organisms by their cultural characters and by the character of the rots induced by them in living trees and in felled timber, as well as a fairly detailed morphological and cultural description of some 45 species of lignicolous Basidiomycetes occurring in Russia, all of which are illustrated by original figures. The relevant literature is given in bibliographical lists at the end of each chapter, and the book terminates with a list of dioecious tree rusts with an indication of their alternate hosts.

CHAMBERLIN (J. E.). **To arms for the American Elm.**—*Amer. Forests*, xl, 5, pp. 195–199, 230–232, 7 figs., 1934.

A popular appeal is made for the co-operation of the American public in the campaign against the elm disease (*Graphium* [*Ceratostomella*] *ulmi*) [*R.A.M.*, xiii, pp. 196, 548], on behalf of which Congress appropriated in April, 1934, $150,000 for control and $50,000 for research.

Les pourritures du bois de Chêne sur pied. [The rots of the wood of standing Oak.]—*Bull. Soc. Centr. Forest. Belgique*, xli, 4–5, pp. 179–194, 1934.

This semi-popular account of rots caused by *Polyporus dryadeus*, *Fomes robustus*, and *Stereum* spp. which affect standing oak trees in France is a reprint of a paper already noticed from another source [*R.A.M.*, xii, p. 795].

NICOLAS (G.) & AGGÉRY (Mlle [B.]). **Note sur deux champignons du Tilleul.** [Note on two fungi on the Lime tree.]—*Rev. Path. Vég. et Ent. Agric.*, xxi, 1, pp. 18–24, 2 pl., 1934.

A brief account is given of two fungi, considered to be new to science, which were found in 1933 on dead and dying twigs of young Dutch limes (*Tilia grandifolia*) [*T. platyphyllos*] which had been planted in 1930 in the suburbs of Toulouse. The first appeared in the form of very numerous black stromata of varying shape and size, at first immersed and later erumpent, which develop into pycnidia with a single, very irregularly contoured cavity from which the spores are exuded in a greyish-white mucus through an ostiole. The spores are hyaline, elliptical, slightly fusiform, straight, continuous, and 5 to 8 by 2 to 2·5 μ in diameter; they are borne on slightly bent sterigmata, tapering towards the apex, and 10 to 14 μ in length. The organism is named *Dothiopsis tiliae*. The second fungus is characterized by a fairly loose stroma, white

inside and orange-coloured on the surface, very irregular in shape, at first immersed and later erumpent. The spores are formed on very long (150 to 160 μ), septate conidiophores arising from the surface of the stroma; they are hyaline, ovoid, occasionally slightly bent, with a faintly brownish-yellow wall, at first one- and later two-celled, and measure 14 to 20 by 7 to 8 μ. This fungus is named *Septomyxa longipes*. Latin diagnoses of both species are appended.

While the relationship of these two organisms to the host has not yet been established, the indications are that *D. tiliae* is parasitic and may be the cause of the death of the twigs. *S. longipes*, on the other hand, is believed to be a saprophyte, appearing on the host long after the first; there was also some evidence that it is capable of parasitizing the pycnidia of *D. tiliae*.

Venkata Rao (M. G.). **A preliminary note on the leaf-curl mosaic disease of Sandal.**—*Mysore Sandal Spike Invest. Ctte. Bull.* 3, 5 pp., 4 pl., 1934.

The writer's preliminary investigations on the leaf curl mosaic of sandal (*Santalum album*) in south India have already been noticed from another source [*R.A.M.*, xiii, p. 338].

Guyot (A. L.). **Note sur une maladie chancreuse du Pin sylvestre dans le Nord de la France.** [Note on a canker disease of *Pinus sylvestris* in the north of France.]—*Rev. Path. Vég. et Ent. Agric.*, xxi, 1, pp. 33–38, 1 pl., 1934.

A brief account is given of a disease of *Pinus sylvestris* which has been observed for several years in northern France, where this tree is chiefly used for the reafforestation of steep, calcareous declivities, the soil on which is very dry and permeable, with the consequence that the trees on it make but a poor growth and are frequently subject to the attacks of fungal and insect parasites. The trouble in question is characterized by the formation on the twigs, especially of young and debilitated trees, of ovoid or fusiform, depressed cankers up to 15 cm. long but never over 3 cm. wide, frequently filled with large masses of solidified gum-like substance; the affected shoots and twigs wilt and finally die. The lesions were found to be in constant association with a Discomycete, with asci 73 to 90 by 8 to 11 μ, fusoid, straight or slightly bent, hyaline, continuous or bicellular ascospores, 16 to 27 by 4 to 6 μ, and filiform paraphyses, 2 μ in diameter. These characters are intermediate between those of *Crumenula pinicola* [*R.A.M.*, xi, p. 136] and *C. sororia*, and since the French fungus appears to be a connecting link between these two species, the author considers that they should be reunited under one name, which for reasons of priority should be *C. pinicola*.

Boyce (J. S.), Carlisle (G.), Foster (J.), Hawley (R. C.), Riley (J. E.), & Tillotson (C. R.). **Control of the White Pine blister rust. Sub-committee report to New England section, Society of American Foresters.**—*Journ. of Forestry*, xxxii, 5, pp. 590–593, 1934.

The outstanding fact emphasized in this report in relation to

white pine (*Pinus strobus*) blister rust (*Cronartium ribicola*) is that, in the absence of control, the tree cannot be perpetuated in New England except over limited areas where the number of currant and gooseberry bushes is small [*R.A.M.*, xiii, p. 282]. In those forests where white pine forms a significant proportion of the stand (upwards of 21 per cent.), it is a highly desirable, and probably an essential species, being adapted to special uses for which none of the proposed substitutes so far tested is equally appropriate. Initial control had been established at the end of 1933 on 81·2 per cent. of the total pine area of New England worth protecting against the rust, while in 10·2 per cent. of the region the *Ribes* eradication campaign was maintained by reworking. The annual charge for the protection of white pine from blister rust in blocks of 50 acres and upwards will vary from 4 to 15 cents per acre annually over the period of the rotation.

RÖHRIG (H.). **Verbreitung und Bekämpfung des Kiefernbaumschwammes in den Staatsforsten des Regierungsbezirks Potsdam.** [The distribution and control of the Pine tree fungus in the State forests of the Potsdam administrative district.]—*Forstarchiv*, x, 9, pp. 137–146, 1934.

The information on the distribution of *Trametes pini* [*R.A.M.*, vii, p. 292; x, p. 631] in the pine forests of the Potsdam administrative district of Germany is summarized, with observations on the systematic campaign for the eradication of the fungus now in progress under Government auspices. During the period 1928–31, 31 per cent. of the total number of infected trees found were felled.

LÖFFELMANN. **Auftreten der Schütte (Lophodermium macrosporum R. Hart.) an Fichtenstangenhölzern im westlichen Erzgebirge.** [The occurrence of leaf fall (*Lophodermium macrosporum* R. Hart.) on Spruce pole timber in the western Erzgebirge.]—*Südetendeutsche Forst- und Jagdzeit.*, xxxiii, pp. 13–14, 1933. [Abs. in *Neuheiten auf dem Geb. des Pflanzensch.*, xxvii, 3, p. 64, 1934.]

Lophodermium macrosporum [*R.A.M.*, x, p. 416] has been observed producing a rust-brown discoloration of spruce [*Picea excelsa*] foliage on the slopes of the Rothaubach Valley and its extensions in the western Erzgebirge [Saxony], the affected crowns presenting a mottled appearance. The trees have been suffering from the after-effects of smoke injury from a factory transferred elsewhere in 1930, and an improvement in their condition may ensue on the gradual recovery of the soil from acidification.

LUTZ (L.). **Les champignons du genre 'Xanthochrous', agents de destruction des bois sur pied ou abattus.** [Fungi of the genus '*Xanthochrous*', decay agents in standing or felled timber.]—*Bull. Soc. Myc. de France*, xlix, 3–4, pp. 377–380, 1934.

The author gives a brief account of his investigation of the rot caused by *Xanthochrous* [*Polyporus*] *hispidus* (stated to attack a fairly wide range of forest, ornamental, and fruit trees in France)

in plane trees and by *X.* [*P.*] *cuticularis* in oaks [*R.A.M.*, vii, p. 812], the results of which showed that the effect of these fungi on the ligneous substance of the hosts is very similar in its main lines to that of *Coriolus* [*Polystictus*] *versicolor* described by him in a previous communication [ibid., x, p. 700].

Moll (F.). **Ancora sulla imbibizione e conservazione dei legnami.** [A further note on the impregnation and preservation of timber.]—Reprinted from *Il Legno*, xii, 11, 3 pp., 1934.

During the period 1930–3 there was a considerable reduction in the number of telegraph poles subjected to preservation in Germany as compared with former years (100,000 per annum, of which three-quarters were treated by the Rueping process and the remainder by kyanization) [*R.A.M.*, xi, p. 15; xii, p. 670]. Some recent Italian estimates of the durability of treated timber are stated to require correction, the averages for five standard methods, from well-founded information at the writer's disposal, being as follows: Rueping (60 kg. of oil per cu. m.) 33 years, kyanization 27, impregnation with zinc chloride 14, Boucherie [ibid., xi, p. 815] 20, and basilite [ibid., xi, p. 14] 16. Aczol [loc. cit.] has given somewhat disappointing results, the utility of the poles treated with this substance extending over a period of only ten years instead of the anticipated 15. A provisional estimate for the durability of the Giussani process, combining coal-tar and zinc chloride, is 15 years.

Liese [J.]. **Holzschutz im Hochbau.** [Wood protection in tne superstructure.]—*Biol. Reichsanst. für Land- und Forstw., Flugbl.* 91, Neubearb. 2. Auflage [2nd revised edn.], 4 pp., 1934.

Some general observations are made on the activities of wood-destroying fungi in relation to the protection of structural timber in Germany, supplemented by a list of preservatives of established efficacy with directions for their application.

Sanborn (J. R.). **Microbiological film production.**—*Indus. & Engin. Chem.*, xxvi, 5, pp. 532–533, 1 fig., 1934.

An extended account is given of the writer's investigations on slime-forming organisms in American pulp and paper mills, and their utilization in the production of parchment, a note on which has already appeared [*R.A.M.*, xii, p. 545]. The species of *Oidium* and *Monilia* concerned are provisionally referred to *O.* [*Oospora*] *lactis* [ibid., xiii, p. 579] and *M. candida* [*Candida vulgaris*].

Ogilvie (L.) & Mulligan (B. O.). **Progress report on vegetable diseases. V.**—*Ann. Rept. Agric. & Hort. Res. Stat. Long Ashton, Bristol, for 1933*, pp. 98–120, 2 pl., [1934].

As in previous years [cf. *R.A.M.*, xi, p. 758; xiii, p. 139] this report contains notes on a number of diseases of interest. Of various control treatments tested against root rot of violets (*Rhizoctonia crocorum*) [*Helicobasidium purpureum*] only mercuric chloride 1 in 1,600 appeared to be at all effective.

Some of the varieties of dwarf beans [*Phaseolus vulgaris*]

previously found to be resistant to halo blight (*Bacterium medicaginis* var. *phaseolicola*) [ibid., xiii, p. 139] are now being extended in the Evesham area with satisfactory results. The value of early roguing in control was demonstrated.

Varietal trials with dwarf beans for resistance to foot rot (*Fusarium solani* var. *martii* (syn. *F. martii* var. *phaseoli*) [ibid., xi, p. 759; xii, p. 71] and possibly other *Fusaria*) indicated that Superlative, Black Wonder, and perhaps other varieties are somewhat resistant. Observations confirmed the view that the disease can remain active in the soil for many years even when dwarf beans are not grown.

Part of a large planting of Prizewinner runner beans [*P. multiflorus*] was very severely affected by *Bact. medicaginis* var. *phaseolicola* while part was practically healthy; inquiry showed that to assist germination the grower had soaked some of the seed in warm water for six hours before planting and that this seed had given rise to the severely diseased plants. Seed similarly treated at the Research Station gave 77 per cent. infection as against 18 per cent. for the unsoaked controls.

The first symptoms of the wilt of runner beans previously reported to be associated with a *Fusarium* [ibid., xiii, p. 139] may appear on the primary pair of entire leaves, the margins of which turn yellowish green, this being followed by the wilting and withering of parts of the leaf blade, which becomes dry and brittle. The margins of the later compound leaves often roll inwards and the leaflets droop. These symptoms appear progressively in the younger leaves until the whole plant withers and dies. In varietal resistance trials the following gave the best results in descending order of resistance: Giant Painted Lady, Czar, Sutton's Scarlet, Painted Lady Giantess, and White Prizewinner. Positive results in artificial inoculation experiments in pots were obtained by soil inoculation with the *Fusaria* concerned in three localities, and with diseased bean stems, and in the open by soil inoculation with the *Fusarium* obtained from one locality, the causal organism being reisolated in all cases.

Brussels sprouts plants given two applications of 1 in 1,600 mercuric chloride solution, at the rate of about ½ pint to each plant, showed 28 per cent. free from club root (*Plasmodiophora brassicae*), as against 7 and 12·5 per cent., respectively, for two lots of untreated controls.

In a varietal trial of winter lettuces for resistance to ring spot or 'rust' (*Marssonina panattoniana*) [ibid., ix, p. 224] the least infection was shown by May King, Syston Glory, and Standwell. In a similar test against *Botrytis cinerea* [ibid., xiii, p. 559] the varieties Spring Beauty, Imperial, Arctic, and Lee's Immense showed 96, 95, 85, and 85 per cent. survivals through the winter, respectively. Much of the non-hearting of lettuces in the Evesham area is attributed to mosaic.

As in previous years, late autumn or early winter spraying with tar-oil gave considerable control of mint rust (*Puccinia menthae*) [ibid., ix, p. 558]. The teleutospores were found to germinate at temperatures tested between 33° and 60° F.

Further satisfactory inoculations were carried out on peas with

cultures of the *Fusarium martii* group [ibid., xiii, p. 139] associated with foot rot. The work on pea seed disinfection [loc. cit.] was continued. Diseased seed (infected mostly with *Mycosphaerella pinodes* and *Ascochyta pisi*) treated with ceresan gave a crop of 1,076 lb. as against one of 1,000 lb. from the control.

White (H. L.). **Vegetable diseases.**—*Nineteenth Ann. Rept. Cheshunt Exper. & Res. Stat., Hertfordshire, 1933*, pp. 52–54, 1934.

After briefly describing the symptoms of grey mould or wilt of lettuce (*Botrytis*) [*cinerea*: see preceding abstract] the author states that few of his direct isolations from diseased plants yielded the fungus, contaminating bacteria, which proved to be incapable of causing serious primary lesions or killing the plants as occurred when the *Botrytis* was used, being frequently obtained. The latter fungus caused a true vascular wilt due to toxins liberated by it, and differed in this respect from *Sclerotinia sclerotiorum*.

Material damage to autumn-grown glasshouse runner beans [*Phaseolus multiflorus*] was caused by a wilt in some respects resembling that described by Butcher as due to *Bacillus carotovorus* [*R.A.M.*, iv, p. 647], but in others agreeing rather with that caused by *Fusarium martii* var. *phaseoli* [see preceding abstract]. Isolations have so far yielded only bacteria.

Larson (R. H.) & Walker (J. C.). **Soil treatment in relation to clubroot of Cabbage.**—*Journ. Agric. Res.*, xlviii, 8, pp. 749–759, 1934.

This is a detailed report of the authors' experiments from 1930 to 1932, inclusive, in Wisconsin, carried out in continuation of Wellman's investigation on the control of club root (*Plasmodiophora brassicae*) of crucifers [*R.A.M.*, ix, p. 693], especially on the cabbage. The results of field tests on two types of silty clay loam showed that calcium hydrate and calcium or magnesium carbonate, at doses sufficient to raise the P_H value of the soil to 7·1 and over, did not generally inhibit the development of the disease. Under greenhouse conditions, however, infection of the plants was perceptibly reduced in the same soils treated with sufficient amounts of these three substances and of calcium oxide to raise their reaction to about P_H 7, and was usually completely inhibited at P_H 7·2 or above at high, intermediate, and low, relatively constant moisture levels; fluctuations in soil moisture at relatively low levels and forced aeration of the soil, however, permitted varying degrees of infection. These results are considered to indicate that low, fluctuating soil moisture is an important factor in limiting the efficacy of lime in the control of club root in the field.

Walton (C. L.), Ogilvie (L.), & Mulligan (B. O.). **Observations on the Pea strain of the eelworm Heterodera schachtii and its relation to 'Pea sickness'.**—*Ann. Rept. Agric. & Hort. Res. Stat. Long Ashton, Bristol, for 1933*, pp. 74–85, 2 pl., [1934.]

Peas in the Evesham district of Worcestershire attacked by the eelworm *Heterodera schachtii* are almost invariably also affected by foot rot caused by *Fusarium* spp. [*R.A.M.*, xiii, p. 139]. When

severely attacked, the diseased plants are dwarfed, pale, and tend to die off prematurely. Affected areas usually occur in well-marked patches in the field. So far as has been ascertained at present, the dwarfing and yellowing are mainly due to the eelworm and the premature death to the *Fusaria*. There appears to be no intimate relation between the organisms causing the two sets of symptoms, and no correlation was established between soil type and the amount of nematode infestation or foot rot present. Further investigations are in progress.

RADEMACHER (B.). **Erfahrungen über die wichtigsten Krankheiten der Ackerbohne und ihre Bekämpfung.** [Experimental observations on the most important Broad Bean diseases and their control.]—*Deutsche Landw. Presse*, lxi, 21, pp. 253–254; 22, pp. 275–276; 23, p. 290, 8 figs., 1934.

A broad bean (*Vicia faba*) disease of which the importance is not generally recognized in Germany is foot rot, attributed by H. Pape to *Fusarium* [*herbarum* var.] *tubercularioides* and by Kirchner to *F. vasinfectum* [*R.A.M.*, vi, p. 258], which causes a black discoloration extending from the root or stem base over the whole plant and eventually leading to general collapse. The symptoms are most pronounced during the hot weather of July and August. The pods (chiefly when injured) and seeds may also be attacked. In 1933 the reduction of yield through foot rot on five varieties at Kitzeberg (a north German branch of the Biological Institute) ranged from 29 to 46·9 per cent. Early sowing has been found to diminish the incidence of foot rot, the percentage of which on the Rosenhof variety sown on 29th March, 1933, was only 15·1 compared with 69 for the planting of 4th May. Another form of foot rot is caused by *Bacillus phytophthorus*.

Rust (*Uromyces fabae*) [ibid., xii, p. 749] is also responsible for heavy losses in late-sown broad bean crops, especially of the Lohmanns Weender and Oberbehmer Dicke varieties, Friedrichswerther, Lüneburger Saxa, and Rosenhofer being comparatively resistant to this disease. Anthracnose (*Ascochyta* spp., including *A. pisi*) [ibid., x, p. 284] occasionally causes severe injury to leaves, stems, and pods, while two leaf spots, *Cercospora zonata* and *C. fabae* [ibid., xii, p. 747], are usually of minor importance. Böning's investigations on mosaic of *V. faba* [ibid., vii, p. 134] are briefly summarized.

HIRATSUKA (N.). **Physiological studies on Uromyces fabae, f. sp. Viciae-Fabae.**—*Bot. Mag.*, Tokyo, xlviii, 569, pp. 309–325, 4 figs., 1934.

A detailed, tabulated account is given of the writer's physiological studies on *Uromyces fabae* f. sp. *viciae-fabae* [*R.A.M.*, xii, p. 596] in Japan.

The optimum temperature for uredospore germination in the rust appears to range from 16° to 22·5° C. On a film of sterilized water at 20° to 22° germination commenced within 50 minutes, and by the end of 12 hours the germ-tubes had attained a length of 560 μ and were branched. Maltose, lactose, d-glucose, sucrose, and l-fructose in varying concentrations proved suitable media for

the germination of the uredospores, which was not appreciably influenced by light or darkness. The uredospores succumbed to 5 minutes' exposure to wet heat at 46°, 10 minutes' at 42° to 44°, 20 minutes' at 40°, and 30 minutes' at 38°; at 0° to 5° viability was maintained for more than 75 days. The maximum development of uredosori in inoculation tests on broad beans took place at 14° to 24°, decreasing at 26° to 30°, while at 2° to 6° there was no sign of infection. The numbers of stomata on the upper and under surfaces of broad bean leaves are almost equal, with the result that the uredosori of the rust occur in the same profusion on both. All the five broad bean varieties tested were susceptible to infection, but some degree of resistance was shown by seven of the eighteen pea varieties used, namely, Forty days edible podded, American Wonder, Sapporo-ao, Marrowfat No. 2, Dwarf podded, Dwarf sugar, and Radio.

Canada Department of Agriculture, Destructive Insect and Pest Act Advisory Board, Regulations under the Destructive Insect and Pest Act, Regulations Nos. 14 (Foreign) 5th Revision, 17 (Foreign) 1st Revision, and 20 (Foreign) P.C. 342.—4 pp., 1934.

With a view to preventing the introduction into the Dominion of Canada of the phony peach disease [*R.A.M.*, xiii, p. 38], the importation is prohibited as from 9th May, 1934, of peach or nectarine trees or roots or any kinds or varieties of trees or shrubs grafted or budded on such roots from the United States of America, unless each consignment is accompanied by a duly authenticated certificate vouching for the absence of the disease in question from the nursery of origin and from the area within a one-mile radius of the same. Moreover, to prevent the introduction of peach yellows [ibid., xii, pp. 454, 518] into British Columbia, the importation into that province of fresh peaches, nursery stock, and fruit pits or seeds for propagation is prohibited from the States of Wisconsin, Illinois, Missouri, Arkansas, and Texas, and from all States to the east of those mentioned.

As from 9th May, 1934, the importation into the Dominion of Canada from all countries of all species and varieties of *Ulmus* and *Zelkova*, including elm logs or burls, is prohibited with the object of preventing the introduction of the Dutch elm disease [*Ceratostomella ulmi*].

In order to prevent the introduction into the Dominion of Canada of blue mould of tobacco [*Peronospora tabacina* or *P. nicotianae*: *R.A.M.*, xiii, pp. 132, 602], the importation of tobacco seed (*Nicotiana tabacum*), including all hybrids and varieties, from the Commonwealth of Australia and the United States of America is prohibited as from 9th May, 1934.

Plant quarantine import restrictions, Island of Cyprus. United States Department of Agriculture. Bureau of Plant Quarantine. Service and regulatory announcements, January–March, 1934. Quarantine and other official announcements. —pp. 17–22, 1934.

A summary, based on Orders No. 1054 (13th May, 1925), 1305

(20th May, 1929), and 1421 (23rd April, 1931), is given of the plant quarantine restrictions in force in Cyprus.

Palestine import regulations.—*Cyprus Agric. Journ.*, xxix, 2, pp. 56–57, 1934.

By regulations which came into force in August, 1934, the importation of plants (other than those covered by separate restrictions) into Palestine is permitted if they are certified by an officer of the phytopathological service of the country of origin to be apparently free from disease and insect pests. Among those covered by separate restrictions some are totally prohibited. These include bananas, all species of citrus except citrus fruits from Egypt and Cyprus, tomatoes, palms (including dates and date palms), eggplants, as well as several others liable to introduce insect pests. The following are admissible if certified free from the undermentioned diseases and certain [specified] insects: maize seed (*Sclerospora graminicola*), bean seed (*Colletotrichum lindemuthianum*), seed potatoes (*Synchytrium endobioticum, Bacillus phytophthorus.* and *Spongospora subterranea*), cabbage and cauliflower seed (*Pseudomonas campestris*), rose, apple, quince, and pear nursery stock (*Bacterium tumefaciens*), mango (*B. mangiferae*), and fresh peaches (*Clasterosporium carpophilum*).

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, vi, 2, p. 39, 1934.

Norway. By a Royal Decree of 15th December, 1933, supplementary to that of 13th February, 1925 [*R.A.M.*, iv, p. 384], all potato consignments imported into Norway must be accompanied by a duly authenticated certificate vouching for the absence from the country of origin during the six years preceding the date of export of *Synchytrium endobioticum*; and further guaranteeing that the exporting country similarly admits only such consignments as satisfy the requirement indicated above.

Legislative and administrative measures.—*Internat. Bull. of Plant Protect.*, viii, 5, pp. 108–109, 1934.

Uruguay. In accordance with the terms of a Presidential Decree of 10th January, 1934, taking effect three months after the date of issue, all consignments of potato tubers imported into Uruguay must be guaranteed to come from regions free from *Synchytrium endobioticum* and *Spongospora subterranea* and to be free from any other serious parasitic disease. *Actinomyces scabies* may be tolerated up to 5 per cent. infection of the tubers, and on these, not more than 10 per cent. of the surface. A duly authenticated certificate must also be furnished to the effect that the tubers were specially selected for seed; that the farms on which they were grown were under official supervision; and that no evidence was forthcoming of the presence in the crops of leaf roll, mosaic, or other 'degeneration' diseases.